CUTTING EDGE
Network Storage Solutions

RAIDSTOR FC60SS

STORAGE SOLUTION
Fibre Channel/SAS

Installation & User Guide

www.cuttedge.com

Notices

The information in this document is subject to change without notice.

While every effort has been made to ensure that all information in this document is accurate, the Authors accept no liability for any errors that may arise.

No part of this document may be transmitted or copied in any form, or by any means, for any purpose, without the written permission of the Authors.

I

Acknowledgments

All names, brands, products or services are trademarks or registered trademarks of their respective companies.

Contents

Preface vii

International Standards vii

Potential for Radio Frequency Interference vii

European Regulations viii

Safety viii

Battery Safety x

Expansion Connectors x

Rack System Precautions xi

ESD Precautions xi

Recycling of Waste Electrical and Electronic Equipment (WEEE) xi

Data Security xii

Special Tools and Equipment xii

Related Documentation xii

Revision History xiii

1 Introduction 1

1.1 FC60SS Enclosure Platform 1

1.2 FC60SS Expansion Enclosure 2

1.3 The Enclosure Core Product 2

1.3.1 Enclosure Chassis 3

1.3.2 Operator's Panel 4

1.3.3 Alarms 5

1.4 The Plug-in Modules 6

1.4.1 AC Power Supply Module 6

1.4.2 Cooling Module 7

1.4.3 FC60SS RAID Module 9

1.4.4 Battery Module 11

1.4.5 Disk I/O Module 12

1.4.6 Drive Carrier Module 13

1.4.7 Dummy Carrier Modules 14

1.4.8 Blank Modules 14

1.5 FC60SS Enclosure Technical Specifications 14

1.5.1 Dimensions 14

1.5.2 Weight 15

1.5.3 AC Power (350W PSU) 15
1.5.4 Power Consumption 15
1.5.5 PSU Safety and EMC Compliance 15
1.5.6 Power Cords 15
1.5.7 Environment 16
1.5.8 Interfaces 17
1.5.9 FC60SS Module Specification 17
1.5.10 Drive Carrier Module Specification 18

2 Getting Started 19
2.1 Introduction 19
2.2 Planning Your Installation 19
2.2.1 Enclosure Drive Bay Numbering Convention 20
2.2.2 Drive Carrier Configuration 20
2.3 Enclosure Installation Procedures 21
2.3.1 Preparation of Site and Host Server 21
2.3.2 Unpacking the Enclosure System 21
2.3.3 Rack Installation Pre-Requisites 22
2.3.4 Rack Installation Procedure 23
2.3.5 Chassis Installation 25
2.4 Module Installation 26
2.5 Management Interfaces 26
2.5.1 StorView ® Storage Management Software 26
2.5.2 RAID Configuration Utility (Menu-based) 26
2.5.3 RAID Configuration Utility (Text-based) 27
2.6 Enclosure Configuration 27
2.7 Fibre Channel Interface 27
2.8 Ethernet Connection 31
2.9 Enclosures Expansion 32
2.10 Drive Slot Arrangement 33
2.10.1 Drive Location Rules 33
2.10.2 Drive Start 34
2.10.3 Engaging the Anti-tamper Locks 34
2.11 Power Cord Connection 35
2.11.1 Parts Check List 35
2.11.2 Procedure 35
2.12 Grounding Checks 36
2.13 Embedded StorView Initial Setup 37
2.13.1 Setting up the Embedded StorView Module: Microsoft Windows 37
2.13.2 Setting up the Embedded StorView Module: Linux 40

3 Operation 41
3.1 Before You Begin 41
3.2 Power On 41
3.3 Power Supply Module LEDs 41
3.4 Cooling Module LED 42
3.5 Ops Panel LEDs 42
3.6 FC60SS RAID Module LEDs 44
3.7 Disk I/O Module LEDs 45
3.8 Starting the Drives 45
3.8.1 Disk Drive LEDs 45

3.9 Starting StorView 45
3.10 Power Down 46

4 Troubleshooting and Problem Solving 47
4.1 Overview 47
4.1.1 Initial Start-up Problems 47
4.2 Status Indicators (LEDs) 48
4.2.1 Power Supply Module LEDs 48
4.2.2 Cooling Module LED 49
4.2.3 Ops Panel LEDs 49
4.2.4 FC60SS RAID Module LEDs 51
4.2.5 Disk I/O Module LEDs 51
4.2.6 Drive Carrier LEDs 52
4.3 Audible Alarm 52
4.3.1 Audible Alarm Mute 52
4.4 Drive Carrier Module Faults 52
4.4.1 Auto Start Failure 53
4.5 Troubleshooting 53
4.5.1 System Faults 53
4.5.2 Power Supply Faults 54
4.5.3 Thermal Control 54
4.5.4 Thermal Alarm 55
4.5.5 Thermal Warnings 55
4.6 Dealing with Hardware Faults 56
4.7 Continuous Operation During Replacement 56
4.7.1 Ops Panel 56
4.8 Replacing a Module 56
4.9 Power Supply Modules 57
4.9.1 Removing a Power Supply Module 57
4.9.2 Installing a Power Supply Module 57
4.10 Cooling Module 59
4.10.1 Removing a Cooling Module 59
4.10.2 Installing a Cooling Module 60
4.11 FC60SS RAID Module 60
4.11.1 Removing an FC60SS RAID Module 60
4.11.2 Installing an FC60SS RAID Module 62
4.12 Battery Module 63
4.12.1 Removing a Battery Module 63
4.12.2 Installing a Battery Module 64
4.13 Removing/Replacing Disk I/O Modules 65
4.14 Drive Carrier Module 65
4.14.1 Removing a Drive Carrier Module 65
4.14.2 Installing a Drive Carrier Module 66
4.14.3 Installation Procedure 66
4.14.4 Dummy Drive Carrier Module Removal/Replacement 68
4.15 Spare Parts and Ancillary Items 68

Index 69

Intentionally Blank

Preface

What is in this guide

This user guide gives you step-by-step instructions on how to install, configure and connect an FC60SS SAS Enclosure Platform to your host computer system and how to use and maintain the system. Information is also provided on achieving FC60SS RAID enclosure expansion by connecting FC60SS expansion enclosures.

Who should use this guide

This user guide assumes that you have a working knowledge of the SAS -SATA environment into which you are installing your FC60SS Enclosure Platform. If you do not have these skills, or are not confident with the instructions in this guide, do not proceed with the installation.

International Standards

The FC60SS and FC60SS SAS Enclosure Platforms comply with the requirements of the following agencies and standards:

- CE to EN60950
- UL
- cUL

Potential for Radio Frequency Interference

USA Federal Communications Commission (FCC)

Note This equipment has been tested and found to comply with the limits for a class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Properly shielded and grounded cables and connectors must be used in order to meet FCC emission limits. The supplier is not responsible for any radio or television interference caused by using other than recommended cables and connectors or by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the user’s authority to operate the equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

European Regulations

This equipment complies with European Regulations EN 55022 Class A: Limits and Methods of Measurement of Radio Disturbance Characteristics of Information Technology Equipments and EN50082-1: Generic Immunity.

Safety

All plug-in modules are part of the fire enclosure and must only be removed when a replacement can be immediately added. The system must not be run without all modules in place.

FRAGILE
HANDLE WITH CARE
INSERT INTO ENCLOSURE GENTLY
Warranty void if not returned in Vendor Approved Packaging
Do not remove this item unless a bay blank or replacement module is installed
Unlatch and wait 30 secs for drive to spin down before removal. Place/store drive on cushioned surface.

Drive Carrier Module Caution Label:
Do not operate with modules missing; Spin down time 30 seconds

Permanently unplug the unit if you think that it has become damaged in any way and before you move it

- A FC60SS enclosure can weigh up to 32kg (70.4lb). Do not try to lift it by yourself.

MODEL : RS-1220
Input rating:
100-240V~ , 5.0-2.0 A, 50-60Hz.
LISTED
I.T.E. 27GA
E178353
FCC STATEMENT:
THIS DEVICE COMPLIES WITH PART 15 OF THE FCC RULES
OPERATION IS SUBJECT TO THE FOLLOWING CONDITIONS:
1) THIS DEVICE MUST NOT CAUSE HARMFUL INTERFERENCE.
2) THIS DEVICE MUST ACCEPT ANY INTERFERENCE RECEIVED, INCLUDING INTERFERENCE THAT MAY CAUSE UNDESIRED OPERATION.
WARNING
LIFTING HAZARD
May result in injury
Use assistance when moving or lifting
32kg
(70.4lbs)

Chassis Warning Label: Weight Hazard

- Do not lift a FC60SS enclosure by the handles on the Power Supply modules, they are not designed to support the weight of the enclosure.

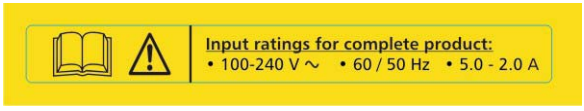
- In order to comply with applicable safety, emission and thermal requirements no covers should be removed and all bays must be fitted with plug-in modules.

FC60SS RAID Module Caution Label: Do not operate with modules missing

Battery Module Caution Label: Do not operate with modules missing

Fan Module Caution Label: Do not operate with modules missing

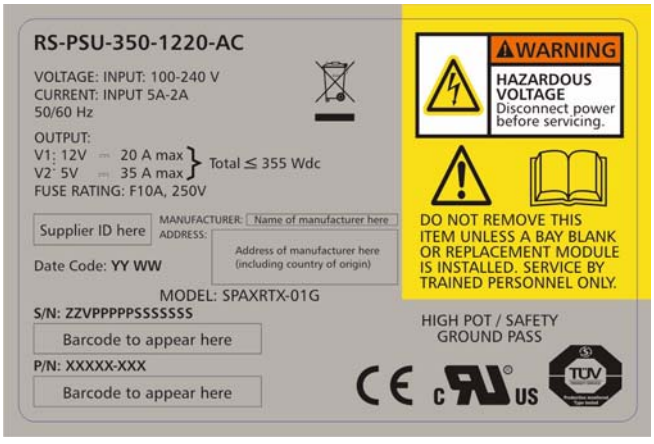
- FC60SS-1220 enclosures must only be operated from a power supply input voltage range of 100 - 240 VAC.



PSU Ratings Label

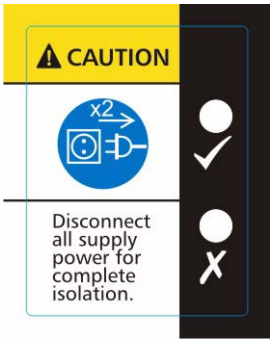
The plugs on the power supply cord are used as the main disconnect device. Ensure that the socket outlets are located near the equipment and are easily accessible.

- The equipment must be operated with two working Power Supply modules.


RS-PSU-350-1220-AC
VOLTAGE: INPUT: 100-240 V
CURRENT: INPUT 5A-2A
50/60 Hz
OUTPUT:
V1: 12V 20 A max
V2: 5V 35 A max
Total ≤ 355 Wdc
FUSE RATING: F10A, 250V
Supplier ID here
MANUFACTURER: Name of manufacturer here
ADDRESS:
Address of manufacturer here (including country of origin)
Date Code: YY WW
MODEL: SPAXRTX-01G
S/N: ZZVPPPPPSSSSSSS
Barcode to appear here
P/N: XXXXX-XXX
Barcode to appear here
WARNING
HAZARDOUS VOLTAGE
Disconnect power before servicing.
DO NOT REMOVE THIS ITEM UNLESS A BAY BLANK OR REPLACEMENT MODULE IS INSTALLED. SERVICE BY TRAINED PERSONNEL ONLY.
HIGH POT / SAFETY GROUND PASS

Power Supply Module Caution Label: Do not operate with modules missing

- A faulty Power Supply module must be replaced with a fully operational module within 24 hours.
- When powered by multiple AC sources, disconnect all supply power for complete isolation.



PSU Warning Label: Power Hazards

- The power connection should always be disconnected prior to removal of the Power Supply module from the enclosure.
- A safe electrical earth connection must be provided to the power cords. Check the grounding of the enclosure before applying power.
- Provide a suitable power source with electrical overload protection to meet the requirements laid down in the technical specification.

Warning **Do not remove covers from the Power Supply module. Danger of electric shock inside. Return the Power Supply module to your supplier for repair.**

PSU Safety Label: Electric Shock Hazard Inside

Caution *If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.*

Battery Safety

The Li-Ion battery is user replaceable, please refer to section 4.12, ”Battery Module”, on page 63.

Warning **There is a danger of explosion if the battery is incorrectly replaced.**

Dispose of used batteries in accordance with the manufacturer’s instructions and national regulations.

Expansion Connectors

Important **Class 1 Laser Product:**
If fitted with Optical modules, the modules must be a UL (or other North American NRTL) RECOGNISED COMPONENT and must be approved by TUV (or other European product safety test house) and the laser in the module must comply with Laser Class 1, US 21 CFR (J) and EN 60825-1.

EMC Precautions

If passive copper cables are connected, the cable must not have a connection to a common ground/earth point.

Rack System Precautions

The following safety requirements must be considered when the unit is mounted in a rack.

- The rack design should incorporate stabilizing features suitable to prevent the rack from tipping or being pushed over during installation or in normal use.
- When loading a rack with the units, fill the rack from the bottom up and empty from the top down.
- System must be operated with low pressure rear exhaust installation (Back pressure created by rack doors and obstacles not to exceed 5 pascals [0.5mm Water gauge])
- The rack design should take into consideration the maximum operating ambient temperature for the unit, which is 40°C when two Power Supply modules are fitted.
- The rack should have a safe electrical distribution system. It must provide overcurrent protection for the unit and must not be overloaded by the total number of units installed in the rack. Consideration of the units nameplate rating should be used when addressing these concerns.
- The electrical distribution system must provide a reliable earth for each unit and the rack.
- Each power supply in each unit has an earth leakage current of <1.5mA maximum at 60Hz, 264 V AC per PSU. The design of the electrical distribution system must take into consideration the total earth leakage current from all the power supplies in all the units. The rack will require labelling with "HIGH LEAKAGE CURRENT. Earth connection essential before connecting supply".
- The rack when configured with the units must meet the safety requirements of UL 60950 and IEC 60950.

ESD Precautions

Caution *It is recommended that you fit and check a suitable anti-static wrist or ankle strap and observe all conventional ESD precautions when handling FC60SS-1220 plug-in modules and components. Avoid contact with backplane components and module connectors, etc.*

Recycling of Waste Electrical and Electronic Equipment (WEEE)

At the end of the products life, all scrap/ waste electrical and electronic equipment should be recycled in accordance with National regulations applicable to the handling of hazardous/ toxic electrical and electronic waste materials.

Please contact Cutting Edge for a copy of the Recycling Procedures applicable to your product.

Important **Observe all applicable safety precautions, e.g. weight restrictions, handling batteries and lasers etc., detailed in the preceding paragraphs when dismantling and disposing of this equipment**

Data Security

- Power down your host computer and all attached peripheral devices before beginning installation.
- Each enclosure contains up to 12 removable disk drive modules. Disk units are fragile. Handle them with care, and keep them away from strong magnetic fields.
- *All* the supplied plug-in modules, dummy carriers and blank modules must be in place for the air to flow correctly around the enclosure and also to complete the internal circuitry.
- If the subsystem is used with plug-in modules, dummy carriers or blank modules missing for more than a few minutes, the enclosure can overheat, causing power failure and data loss. Such use may also invalidate the warranty.
- If you remove any drive module, you may lose data.
  - If you remove a drive module, replace it immediately. If it is faulty, replace it with a drive module of the same type and capacity
- Ensure that all disk drives are removed from the enclosure before attempting to manhandle or move the rack installation.
- Do not abandon your backup routines. No system is completely infallible.

Special Tools and Equipment

There are no special tools required but in order to complete the assembly of some configurations you may need the following:

- Security keys (one of these should be included with your FC60SS enclosure for use with the drive locks).

Page Left Intentionally Blank

Chapter 1

Introduction

1.1 FC60SS Enclosure Platform

The FC60SS Enclosure Platform is a 2U (rack space) disk drive enclosure, housing twelve low profile (1 inch high), 3.5 inch form factor, which can be either:

- 3.0Gb/s direct dock SAS disk drives,
- 3.0Gb/s direct dock SATA disk drives, or
- 3.0Gb/s dual path SATA disk drives via an active/passive SATA mux transition card.

Important **Mixing of SAS and SATA drives in the same enclosure is only supported in columns, i.e. Column 1 all SAS, Column 2 all SATA etc.**

The system will provide up to 6Tbytes of data storage per enclosure when 500Gb drives are installed.

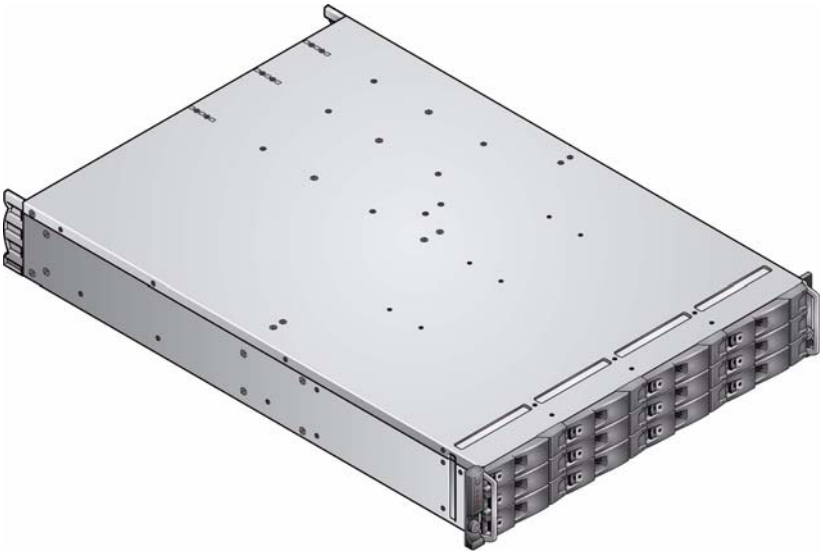


Figure 1–1 FC60SS Enclosure

1.2 FC60SS-XPN Expansion Enclosure

FC60SS RAID enclosure expansion is achieved by connecting FC60SS-XPN expansion enclosures. Multiple enclosures are connected together using SAS patch cables, up to a total of five enclosures. Please refer to section 2.9, ”Enclosures Expansion”, on page 32.

1.3 The Enclosure Core Product

The **FC60SS** design concept is based on an enclosure subsystem together with a set of plug-in modules.

The **FC60SS** SAS Enclosure Platform as supplied comprises:

- **Chassis** and **Backplane** with integral (front panel mounted) **Operator’s Panel** (See Figure 1–6).
- Up to 12 **Drive Carrier Modules** (See Figure 1–16), containing either:
  - 3.0Gb/s direct dock SAS disk drives,
  - 3.0Gb/s direct dock SATA disk drives, or
  - 3.0Gb/s dual path SATA disk drives via an active/passive SATA mux transition card.

  Note: Dummy Carriers modules must be fitted in all unused drive bays to maintain airflow, please refer to section 1.4.7 on page 14.
- Two plug-in **Power Supply Modules**,100-240V AC, 350W (see Figure 1–7)
- One plug-in **Cooling Fan Module** (see Figure 1–8)
- Two plug-in **FC60SS RAID Modules.** (See Figure 1–10), incorporating a FC60SS RAID Controller and a Storview Management Module.

  Note: If only one FC60SS RAID module is installed then a **Blank module** must be fitted in the unused slot. The module should be fitted in Slot 0 and the blank in Slot 1 (where Slot 0 is the lower slot and Slot 1 the upper, see Figure 1–3).

The **FC60SS-XPN** Expansion enclosure platform as supplied comprises

- **Chassis** and **Backplane** with integral (front panel mounted) **Operator’s Panel** (See Figure 1–6).
- Up to 12 **Drive Carrier Modules** (See Figure 1–16), containing either:
  - 3.0Gb/s direct dock SAS disk drives,
  - 3.0Gb/s direct dock SATA disk drives, or
  - 3.0Gb/s dual path SATA disk drives via an active/passive SATA mux transition card.

  Note: Dummy Carriers modules must be fitted in all unused drive bays to maintain airflow, please refer to section 1.4.7 on page 14.
- Two plug-in **Power Supply Modules**,100-240V AC, 350W (see Figure 1–7)
- One plug-in **Cooling Fan Module** (see Figure 1–8)

- Two **Disk I/O Modules** (see Figure 1–14)

  Note: If only one Disk I/O module is installed then a **Blank module** must be fitted in the unused slot. The module should be fitted in Slot 0 and the blank in Slot 1 (Figure 1–5).

1.3.1 Enclosure Chassis

The chassis consists of a sheet metal enclosure assembly containing a Backplane printed circuit board (PCB) and module runner system.

- The chassis front panel incorporates an integral Operator's (Ops) Panel.
- The Backplane PCB provides logic level signal and low voltage power distribution paths.
- Figure 1–2 and Figure 1–3 show front and rear views of a populated **FC60SS** chassis respectively.
- Figure 1–4 and Figure 1–5 show front and rear views of a populated **FC60SS** chassis respectively.
- The chassis is fitted with 19 inch Rack mounting features which enable it to be fitted to standard 19 inch racks and uses 2 EIA units of rack space *(i.e. 3.5" high)*.

The chassis assembly contains 12 drive bays at the front, each of which accommodates the appropriate plug-in drive carrier module. The 12 drive bays are arranged in 3 rows of 4 drives. At the rear, the chassis assembly contains five plug-in module bays to house two Power Supply modules, a Cooling Fan module and two FC60SS RAID modules (which are fitted horizontally), as shown in Figure 1–3

Note A drive bay is defined as the space required to house a single 1.0" high 3.5 inch disk drive in its carrier module, shown in Figure 1–2.

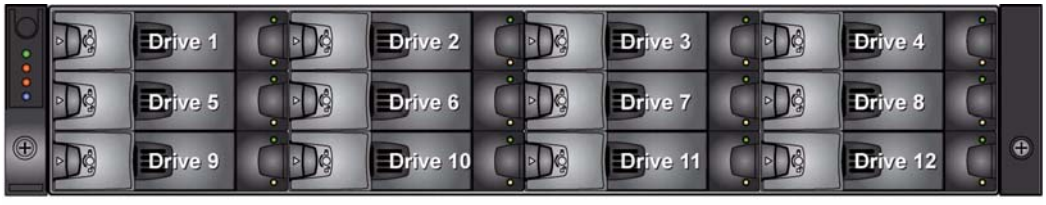


Figure 1–2 FC60SS Enclosure (Front)

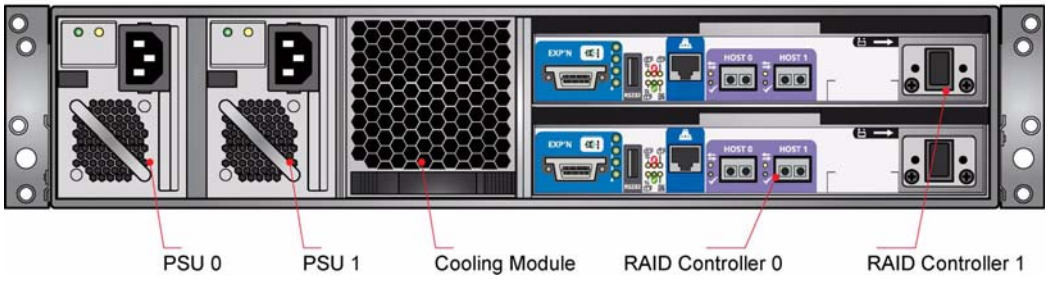


Figure 1–3 FC60SS Enclosure (Rear)

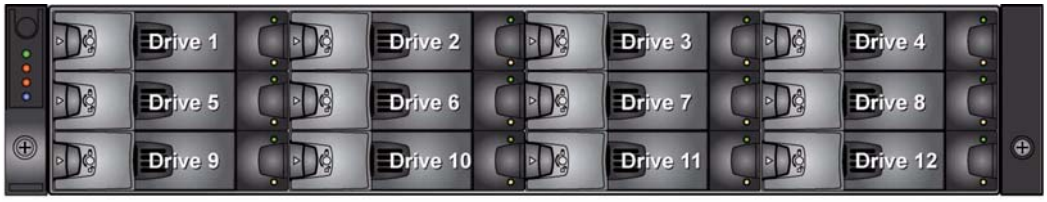


Figure 1–4 FC60SS-XPN Enclosure (Front)

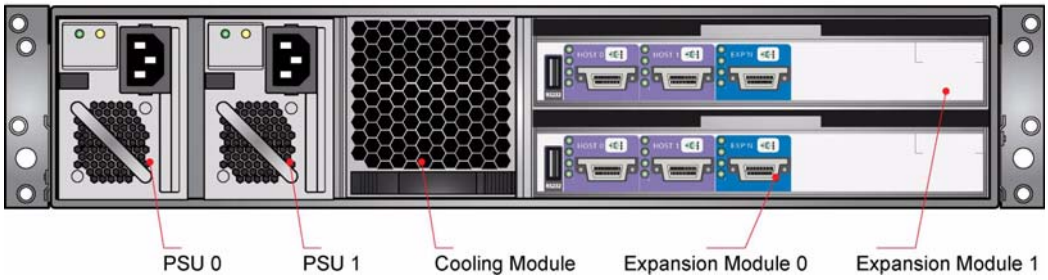


Figure 1–5 FC60SS-XPN Enclosure (Rear)

1.3.2 Operator's Panel

The FC60SS enclosure front panel incorporates an Operator's (Ops) Panel with four LEDs, see Figure 1–6. The Ops Panel provides the user with a high level indication of the operation of the Enclosure. Please refer to Table 3–3, "Ops Panel LED States", on page 43 for details of the LED status conditions.

Caution *The Ops Panel is an integral part of the enclosure assembly and can only be replaced with a replacement enclosure.*

Enclosure replacement should only be performed by trained personnel.

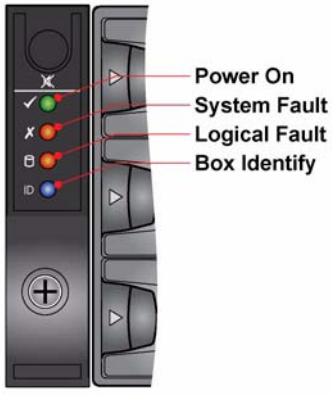


Figure 1–6 Ops Panel

1.3.3 Alarms

1.3.3.1 Visible Alarms

The functional modules have associated status LEDs. The Ops Panel shows a consolidated status for all modules.

LEDs show constant Green or Blue for good or positive indication. Constant or flashing Amber LEDs indicate there is a fault present within that module.

Table 1–1 Status LEDs

LED	State	Description
Power On	**Constant Green:**	Good or positive indication
System Fault	**Constant Amber: fault present**	Indicates a problem with a Power Supply, Cooling or RAID module. Refer to individual modules that contain individual fault LEDs, see Table 4–1 on page 48, Table 4–2 on page 49 and Table 4–4 on page 51
Logical Fault	**Constant Amber: fault present**	Indicates failure of a drive module. The module failing will be indicated by the Fault LED, see Table 4–6 on page 52
Box Identity	**Constant Blue: enclosure identity**	The user can illuminate this via the Management interfaces to indicate which enclosure requires service actions to be performed on it.

Please refer to Table 3–3 on page 43 for a description of the Ops Panel LED states.

1.3.3.2 Audible Alarms

FC60SS enclosures include an Audible Alarm which indicates when a fault state is present. The following conditions will activate the Audible Alarm:

- Fan Fault
- Voltage out of range
- Over temperature
- Thermal overrun
- System fault
- Logical Fault
- PSU Fault
- Removal of 1 PSU
- Invalid cabling

When the Audible Alarm sounds, it may be muted by pressing the Alarm Mute push-button which is incorporated in the enclosure front panel. Please refer to section 4.3.1 on page 52 for more information on this function.

1.4 The Plug-in Modules

An FC60SS enclosure requires the following modules for normal operation:

- 2 x 350W AC Power Supply modules
- 1 x Cooling module
- *FC60SS*: 1 or 2 x FC60SS RAID modules
- *FC60SS*: 2 x Disk I/O modules
- Up to 12 Drive Carrier modules.
- Dummy Carrier modules, as required.

Note: No bays should be left completely empty, Dummy Carrier modules and/or blank modules must be fitted in all unused bays.

1.4.1 AC Power Supply Module

Two 100-240 V AC 350W Power Supply modules (Figure 1–7) are supplied mounted in the rear of the enclosure as part of the enclosure core product.

Figure 1–7 AC Power Supply Module

PSU voltage operating ranges are nominally 115V or 230V AC, selected automatically.

Two LEDs mounted on the rear panel of the Power Supply module (see Figure 1–7) indicate the status of the module:

Table 1–2 Power Supply LEDs

Power On & OK (Green)	Module Fault (Amber)	Status
Off	Off	No AC power (either PSU)
Off	On	No AC power (this PSU only)
Off	On	PSU Fault (over temp, over voltage, over current, PSU fan fail)
On	Off	AC present, PSU on and OK
On	On	Fan Fault

1.4.1.1 Multiple Power Supply Modules

The FC60SS enclosure must always be operated with two Power Supply modules fitted. The two Power Supply modules operate together so that if one fails the other maintains the power supply and cooling while you replace the faulty unit.

Module replacement should only take a few minutes to perform but must be completed within 10 minutes from removal of the failed module.

1.4.2 Cooling Module

The Cooling Module (Figure 1–8) provides system cooling, thermal monitoring and control functions.

System airflow is from front to back of the enclosure:

- Cooling air passes over drives and through the midplane to a central plenum.
- The cooling module pulls air from the plenum and from the RAID modules.
- The PSUs pull cooling air from the plenum at the rear of the enclosure.

Note The system must be operated with low pressure rear exhaust installation (back pressure created by rack doors and obstacles not to exceed 5 pascals {0.5mm water gauge})

Figure 1–8 Cooling Module

The Cooling module incorporates an amber Cooling Module Fault LED, defined in Table 1–3.

Table 1–3 Cooling Module Fault LED

Status	Module Fault (Amber)
Enclosure On - Fan OK	Off
Fan Fail	**On**

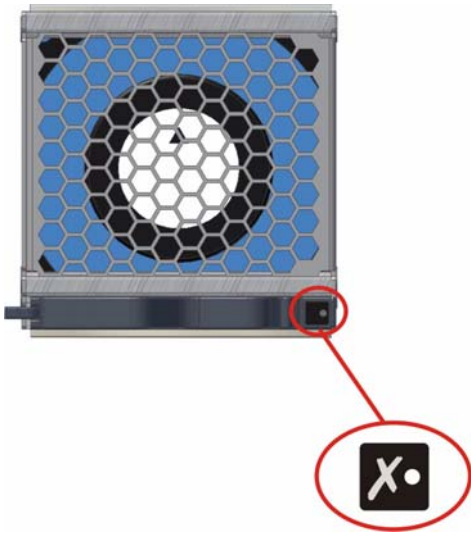


Figure 1–9 Cooling Module Fault LED Location

1.4.3 FC60SS RAID Module

One or two FC60SS RAID modules (according to customer configuration) are supplied mounted in the rear of the enclosure as part of the FC60SS enclosure core product.

The plug-in FC60SS RAID modules have been designed for integration into a FC60SS enclosure, providing external FC cable interfacing with the host computer system.

The Backplane incorporates connection to each of the SAS ports within the FC60SS RAID modules.

The FC60SS RAID module internal processor monitors error conditions on each disk drive port.

Processors housed on the FC60SS RAID modules provide enclosure management interfacing to devices on the Backplane, PSU, FC60SS RAID module and Ops Panel, to monitor internal functions.When the enclosure is supplied in dual controller configuration these processors operate in a dual active configuration to allow failover.

The module incorporates LED indicators, shown in Figure 1–11. please refer to Table 3–4, "FC60SS RAID Module LEDs", on page 44 for details of the LED status conditions.

The FC60SS RAID module has the following external ports.

- Two external (Host) ports that allow for fitting of Small Form Factor Pluggable (SFP) modules, with auto-bypass at the output. Either or both of these SFP ports can be used to provide connection to the Host controllers. Each host port operates at 4Gb/s, giving an effective speed of 8Gb/s; these ports are also backwards compatible with 2Gb/s hosts.

- An SAS expansion port provides for expansion up to a maximum of four FC60SS-XPN enclosures via an SFF-8470 connector.

- An RJ45 10/100BaseT Ethernet port allows the controller to be connected to a network to enable out-of -band management and monitoring using the Embedded Storview GUI software.

  Note: Screened twisted pair Ethernet cable must only be used for connection to the Ethernet port.

- There is also an RS232 socket which provides an alternative user interface to the RJ45 connector.

Caution *Although the RS232 port is similar in appearance to a USB port it requires a special cable and users should NOT attach a USB cable to it.*

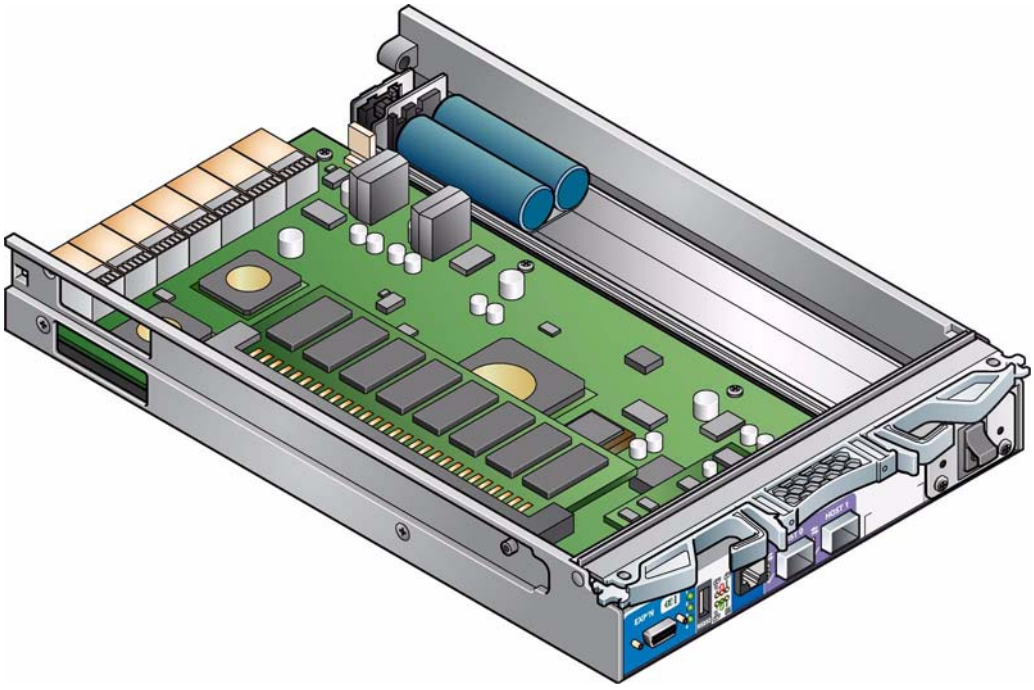


Figure 1–10 FC60SS RAID Module

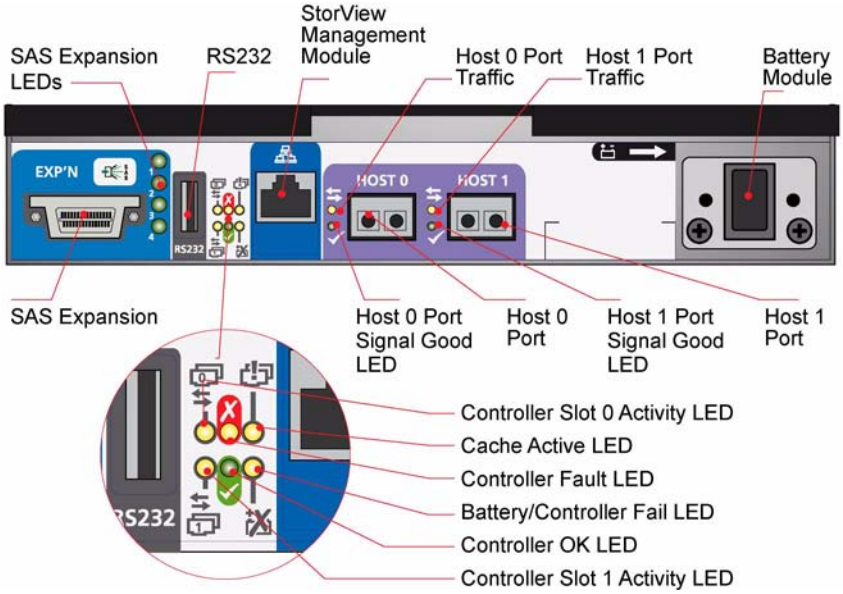


Figure 1–11 FC60SS Module Front Panel

The recommended configurations are shown in sections ***2.7 on page 27*** and ***2.9 on page 32***.

1.4.3.1 StorView ® Management Software

The StorView ® Storage Management software which is embedded in the FC60SS RAID Module is a full-featured graphical HTML-based software suite designed to configure, manage and monitor the FC60SS RAID Module Storage Solution. The module is supplied configured with a base IP address to

to allow the user to connect to it. Please refer to section 3.9, ”Starting StorView”, on page 45 for further information.

1.4.4 Battery Module

The FC60SS RAID module assembly includes a removable Battery module, located as shown in Figure 1–10. The battery module contains a replaceable Li-Ion battery pack, see Figure 1–12. The battery pack provides protection of the cache contents if the AC power fails. The time protected is available via the Management Interface and is dependent on the amount of cache in the system.

Please refer to section 4.12 on page 63 for removal/replacement procedures.

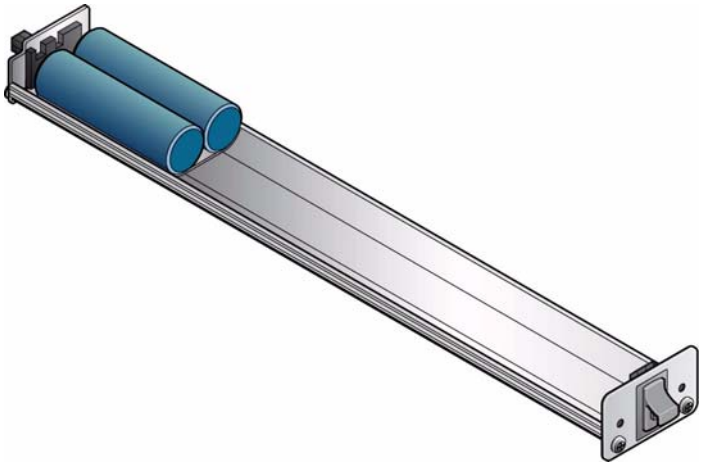


Figure 1–12 Battery Module

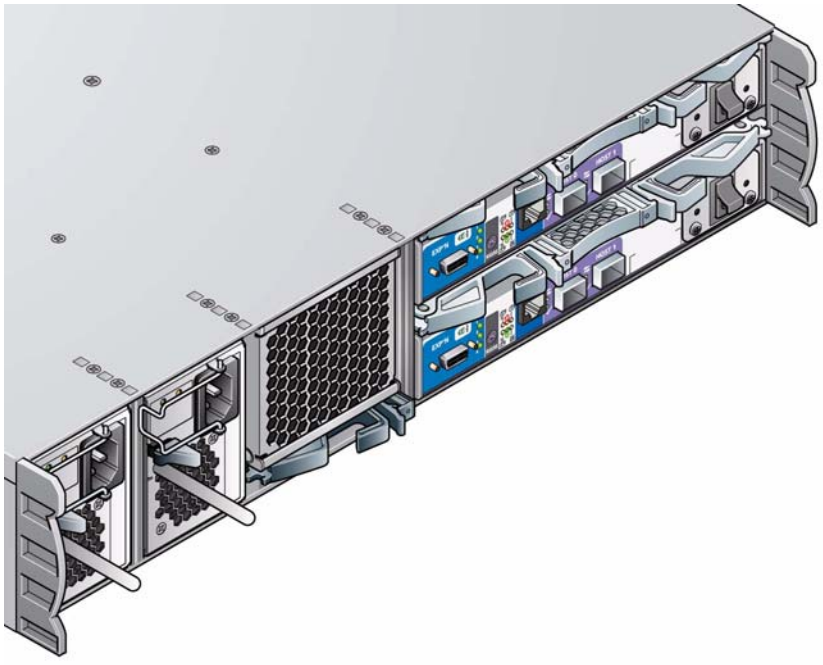


Figure 1–13 Enclosure Rear View

1.4.5 Disk I/O Module

FC60SS-XPN storage expansion subsystems include an enclosure with rear facing bays which house two Disk I/O modules, shown in Figure 1–14.

The plug-in Disk I/O modules have been designed for integration into FC60SS-XPN storage subsystems, utilizing SAS interconnections with the host computer system.

Processors housed on the Disk I/O modules provide enclosure management and interface to devices on the Backplane, PSU, Disk I/O module and Ops Panel, to monitor internal functions. These processors operate in a master slave configuration to allow failover.

The enclosure may be configured with either 1 or 2 modules. If only 1 Disk I/O module is fitted a blank module should be fitted in the unused bay.The module incorporates LED indicators, shown in Table 1–4:

Table 1–4 Disk I/O Module LEDs

LED Functions	State	Description
Host 0 & Host 1 **(Green)**	ON Flashing OFF	Ready Active Not Ready
Expansion **(Green)**	ON Flashing OFF	Ready Active Not Ready

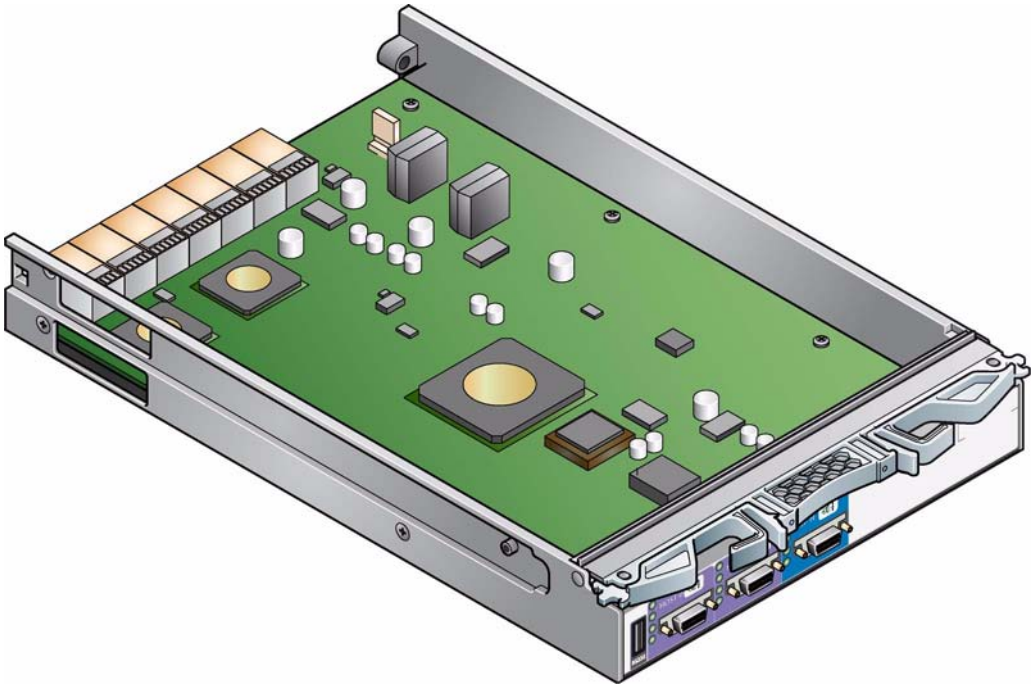


Figure 1–14 Disk I/O Module

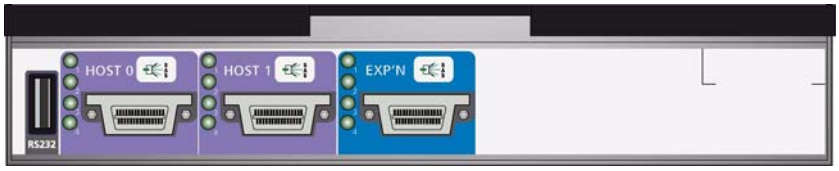


Figure 1–15 Disk I/O Module Front Panel

Note The EXP'N port connects to the Host port on the next FC60SS-XPN enclosure in a multiple enclosure configuration, please refer to section 2.9 on page 32 for further information on enclosure expansion.

1.4.6 Drive Carrier Module

The Drive Carrier Module comprises a hard disk mounted in a carrier. Each drive bay will house a single Low Profile 1.0 inch high, 3.5 inch form factor disk drive in its carrier.The carrier has mounting locations for SAS or SATA drives.

The front cap also supports an ergonomic handle which provides the following functions:

- Camming of carrier into and out of drive bays.
- Positive 'spring loading' of the drive/backplane connector.
- An anti-tamper lock operated by a torx socket type key.

Figure 1–16 Drive Carrier Module

1.4.6.1 Drive Status Indicators

Each drive carrier incorporates two LEDs, an upper (Green) and lower (Amber). In normal operation the green indicator will be ON and will flicker as the drive operates The amber indicator will only be ON if there is a drive fault. If the green LED is OFF when the amber LED is ON, a power control circuit failure is indicated.

1.4.6.2 Anti-tamper Locks

Anti-tamper locks are fitted in the drive carrier handles (Figure 1–17) and are accessed through the small cutout in the latch section of the handle.These are provided to disable the normal 'pinch' latch action of the carrier handle.

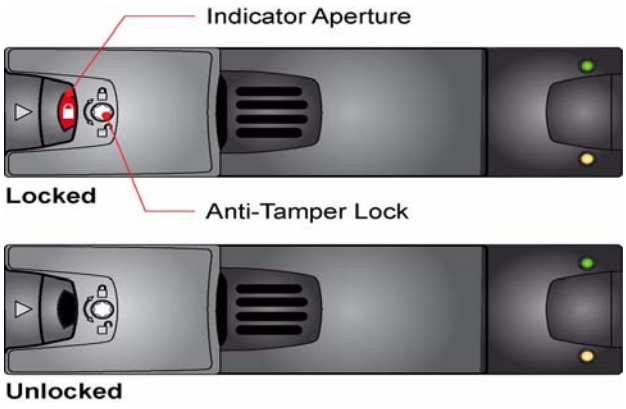


Figure 1–17 Anti-tamper Lock

1.4.7 Dummy Carrier Modules

Dummy Carrier modules are provided for fitting in all unused drive bays. They are designed as integral drive module front caps and must be fitted to all unused drive bays to maintain a balanced airflow.

1.4.8 Blank Modules

When only one FC60SS RAID module is installed, a Blank module must be fitted in the vacant RAID (I/O) module slot at the rear of the enclosure to maintain airflow and ensure correct operation.

Warning **Operation of the Enclosure with *ANY* modules missing will disrupt the airflow and the drives will not receive sufficient cooling. It is *ESSENTIAL* that all apertures are filled before operating the FC60SS enclosure system.**

1.5 FC60SS Enclosure Technical Specifications

1.5.1 Dimensions

Enclosure		**inches**	**mm**
Height		3.46	87.9
Width across mounting flange		19	483
Width across body of enclosure		17.6	447
Depth from flange to rear of enclosure body		21.65	550
Depth from flange to maximum extremity of enclosure (rear hold down)		22.72	577
Depth from flange to furthest extremity at front of unit		1.44	36.5

It is recommended that a rack with a depth of no less than 700mm (27.55 inches) is used with this product.

1.5.2 Weight

Maximum Configuration	32kg (70.4lb)
Empty Enclosure	9kg (19.8lb)

1.5.3 AC Power (350W PSU)

Voltage Range	100--240 VAC Rated
Frequency	50/60 Hz
Inrush Current	<30A @ 230VAC
Power Factor	>0.98
Harmonics	Meets EN61000-3-2

1.5.4 Power Consumption

Power consumption of enclosure with 12x SAS drives running IO, powered by a single PSU (Power One PSU) with extended power lead between PSU and IO Backplane and with two controllers installed at IDLE and ACTIVE operation.

Voltage Rail	IDLE		ACTIVE	
	Average	**Peak**	**Average**	**Peak**
5V	11.51A	13.2A	13.53A	15.7A
12V	12.29A	15.1A	13.17A	20.1A

1.5.5 PSU Safety and EMC Compliance

Safety Compliance	UL 60950 IEC 60950 EN 60950
EMC Compliance	CFR47 Part 15B Class A EN55022 EN55024

1.5.6 Power Cords

1 **United States**

Must be NRTL LISTED (National Recognized Test Laboratory, e.g. UL)

Cord type	SV or SVT, 18 AWG minimum, 3 conductor, 4.5 M max length.
Plug	NEMA 5-15P grounding-type attachment plug rated 120V 10A; *or* IEC 320 C14, 250V, 10A.
Socket	IEC 320, C-13, 250V, 10A.

2 **Europe & Others**

General requirements:-

Cord type	Harmonized, H05-VVF-3G1.0
Socket	IEC 320, C-13, 250V, 10A.

Important **The Plug and the complete power cord assembly must meet the standards appropriate to the country, and must have safety approvals acceptable in that country.**

1.5.7 Environment

Table 1–5 Ambient Temperature and Humidity

	Temperature Range	Relative Humidity	Max. Wet Bulb
Operational	5°C to 40°C	8% to 80% non-condensing	23°C
Non-Operational	1°C to +50°C	8% to 80% non-condensing	27°C
Storage	1°C to +60°C	8% to 80% non-condensing	29°C
Shipping	-40°C to +60°C	5% to 100% non-precipitating	29°C

Airflow	System must be operated with low pressure rear exhaust installation (Back pressure created by rack doors and obstacles not to exceed 5 pascals [0.5mm Water gauge])
Altitude, Operational	0 to 3045 m (0 to 10,000ft)
Altitude, Non-Operational	-305 to 12,192m (-1000 to 40,000ft)
Shock, Operational	Vertical axis 5g peak 1/2 sine, 10ms
Shock, Non-Operational	30g 10ms 1/2 sine
Vibration, Operational	0.21grms 5-500 Hz Random
Vibration, Non-Operational	1.04grms 2-200 Hz Random
Vibration, Relocation	0.3g 2-200 Hz sine
Acoustics	**Sound Power Operating:** • Less than 58 dB LwA measured at 23°C. **Sound Pressure Operating:** • Less than 6.8 Bels LwA measured at 23°C.
Orientation & Mounting	19" Rack mount (2EIA Units)
• Rack Rails	To fit 800mm depth Racks compliant with IEC 297
• Rack Characteristics	Back pressure not exceeding 5 pascals (0.5mm water gauge)
Safety & Approvals	CE, UL, cUL
• EMC	EN55022 (CISPR - A), FCC A

1.5.8 Interfaces

Drive support	See drive carrier specification
Attachment	• 1 domain of 12 drives per FC60SS RAID module • 2 Fibre Channel Host Ports (Arbitrated Loop, Point-Point & Fabric attachment supported) – 2 x SFP optical per FC60SS RAID module • 1 SAS Expansion Port – 1 X SFF

1.5.9 FC60SS RAID Module Specification

Speed	• Host Ports: two 4Gb/sec Fibre Channel, also supporting 2Gb/sec and 1Gb/sec mode • Drive Ports: 3Gb/s SAS, creates connections to a single domain of 12 drives
Mounting	Rear, horizontal in Bay 4 *(see Figure 1–3)*
Connectors	• 2 x SFP connectors for Host 0 and Host 1 Ports, to accommodate optical interconnects (LC to LC cable), maximum length 500m • 1 x 4xSAS Expansion connector (SFF) • 1 x RJ45, 10/100BaseT Ethernet connection • 1 x RS232 *(factory use only)*
Power Consumption	40W

LED Functions

LED Functions	LED State	Definition
Controller Slot 0 Activity*	Amber	When ON the Controller is currently processing data
Controller Slot 1 Activity*	Amber	When ON the Controller is currently processing data
Controller OK	Green	Module OK
Controller Fault	Amber	Fault on this module
Cache Active	Amber	Active cache contents
Battery/Controller Fail	Amber	Fault in battery or charger operation of controller
Host 0 Port Signal Good	Green	When ON the LED denotes that incoming FC signal is good
Host 1 Port Signal Good	Green	When ON the LED denotes that incoming FC signal is good
Host 0 Port Traffic*	Amber	When ON the Controller is processing data on this port
Host 1 Port Traffic*	Amber	When ON the Controller is processing data on this port

SAS Expansion 1*	Green	When ON this port is active
SAS Expansion 2*	Green	When ON this port is active
SAS Expansion 3*	Green	When ON this port is active
SAS Expansion 4*	Green	When ON this port is active

* These LEDs blink on/off when there is module activity.

1.5.10 Drive Carrier Module Specification

Important **Operating FC60SS enclosures with non-approved drives may invalidate the warranty. Please contact your supplier for details of approved drives.**

Module Dimensions	• Height 1.06” (27.05mm(• Width 4.19” (106.55mm) • Depth 8.25” (209.55mm)
Weight	• 0.88kg (1.0” 36Gb drive)
Operating Temperature	5° C to 40° C (when installed in an FC60SS system enclosure with dual Power Supply Modules)
Power Dissipation	18.5 Watts maximum

Chapter 2

Getting Started

2.1 Introduction

In this chapter, you are shown how to install your FC60SS enclosure into an industry standard 19 inch rack cabinet and configure the enclosure sub-system.

Caution *When connecting up FC60SS enclosures, use only the power cords supplied or cords which match the specification quoted in section 1.5.6.*

2.2 Planning Your Installation

Before you begin installation you should become familiar with the configuration requirements of your FC60SS enclosure, detailed in Table 2–1. The correct positions of each of the optional plug-in modules are shown in Figure 2–1. Please refer to sections 2.7 to 2.9 (page 27 to page 32) for details of FC60SS RAID module configurations.

Table 2–1 Enclosure System Configuration

Module	Location
Drive Bays	ALL drive bays must be fitted with a drive carrier module or dummy drive carrier module; no bays should be left completely empty.
Power Supply Modules	Two Power Supply modules must be fitted. Full power redundancy is provided while a faulty module is replaced. Install the Power Supply modules in LH rear Bays (Figure 2–1)
Cooling Module	Install in rear bay, as shown in Figure 2–1
FC60SS RAID Module	Two FC60SS RAID Modules (or 1 FC60SS RAID Module plus1 blank module) can be fitted, according to required configuration. The modules are Installed horizontally (one above the other) in the RH rear Bay (Figure 2–1).

Caution *Blank Modules or Dummy Carrier modules MUST be fitted to ALL unused bays, there will be inadequate drive cooling if any are left open.*

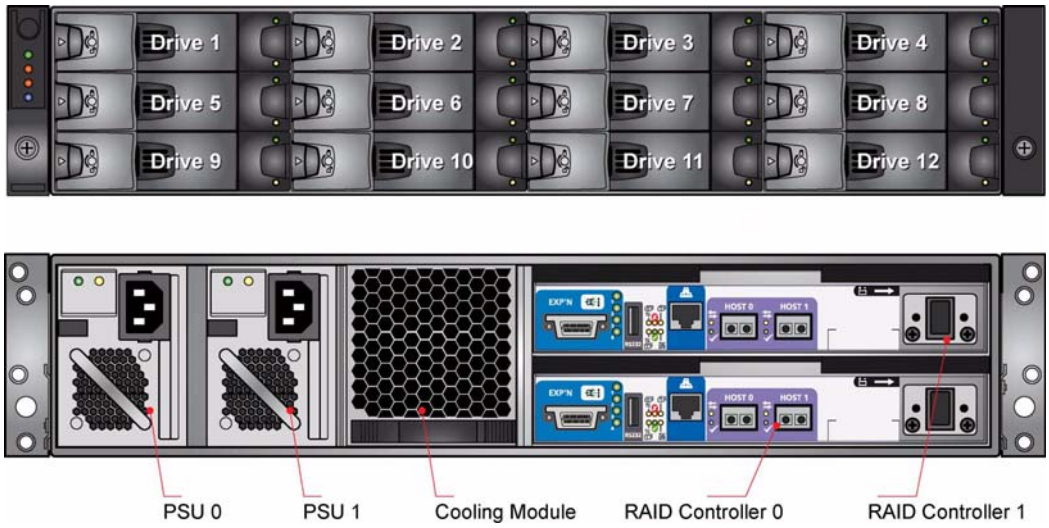


Figure 2–1 Module locations

2.2.1 Enclosure Drive Bay Numbering Convention

The enclosure drive bay numbering convention is shown in Figure 2–1. A drive bay is defined as the space required to house a single 1.0" high 3.5 inch disk drive in its carrier module.

Important **Drive carrier modules must always be fitted in drive locations 1 and 12. This is the minimum configuration required for the system to operate and provide SES Management Services.**

2.2.2 Drive Carrier Configuration

Important **Before you begin installation you should become familiar with the configuration requirements of your FC60SS enclosure, see Table 2–1.**

There must be a drive present in drive locations 1 and 12 to enable SES Communications to operate. Installing drives in both of these bays will provide redundant SES communication paths.

When planning your system configuration, please remember that all FC60SS enclosure drive bays must be filled with either a Drive Carrier or Dummy Carrier module, no bays should be left completely empty.

2.3 Enclosure Installation Procedures

Caution *An FC60SS enclosure with all component parts installed is too heavy for a single person to safely install alone into a Rack cabinet. The following procedures describe the installation of an FC60SS enclosure and highlights any critical co-requisite requirements and good handling practices which we encourage you to follow so as to ensure that a successful installation is achieved in the easiest manner.*

Warning **Ensure that you have fitted and checked a suitable anti-static wrist or ankle strap and observe all conventional ESD precautions when handling FC60SS modules and components.**
Avoid contact with Backplane components and module connectors, etc.

2.3.1 Preparation of Site and Host Server

Before you begin, make sure that the site where you intend to set up and use your FC60SS storage system has the following:

- Standard AC power from an independent source or a rack Power Distribution Unit with a UPS (universal power supply).

- A host computer with a standard Fibre Channel HBA (host bus adaptor) with the latest BIOS and drivers. Follow the instructions provided with your HBA and install the HBA and its driver software, if necessary.

  Note: The FC60SS system supports most of the widely used operating systems, however deployment on Microsoft Windows requires the***.inf*** driver file which is found on the Software and Manuals CD.
  (For Windows Servers: Insert the Software and Manuals CD and install the***.inf*** file.)

2.3.2 Unpacking the Enclosure System

The package contents and unpacking procedure are outlined in Figure 2–2.

The Accessory Box contains the AC power cord(s), a serial communication cord and the Software and Manuals CD. The Accessory Box Insert contains the adjustable rail slides and hardware parts to rack mount the enclosure.

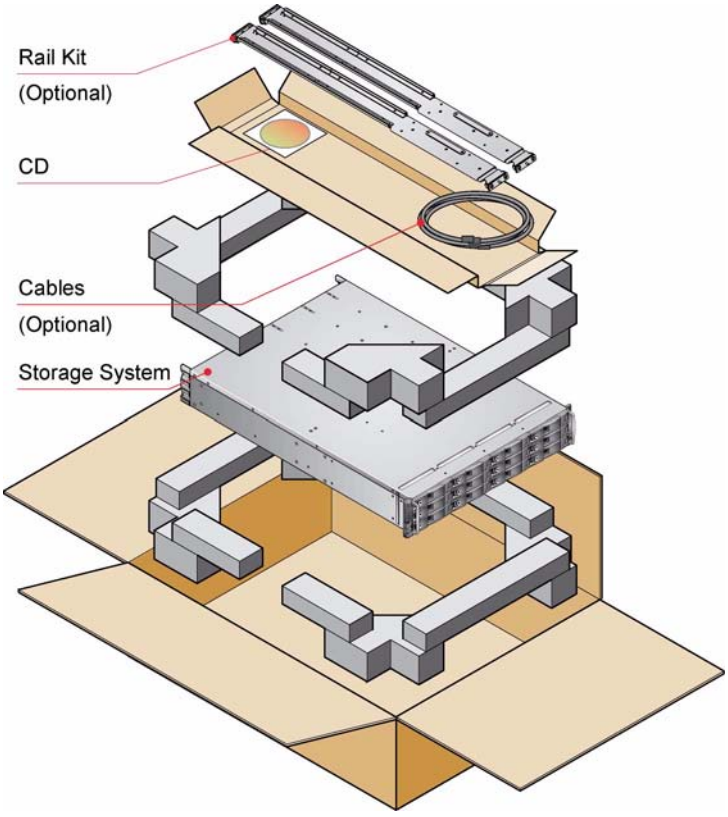


Figure 2–2 Unpacking the Enclosure System

2.3.3 Rack Installation Pre-Requisites

The FC60SS enclosure is designed for installation into an industry standard 19 inch cabinet capable of holding the unit.

- Minimum depth 700 mm from front flange to rear metalwork (excludes rear cabling).
- Weight: up to 32kg dependent upon configuration per enclosure.
- A minimum gap of 25mm (1inch) clearance between the rack cover and front of drawer; and 50mm (2 inches) rear clearance between rear of drawer and rear of rack is recommended in order to maintain the correct air flow around the enclosure.
- The rack should present a maximum back pressure of 5 pascals (0.5mm water gauge).

2.3.3.1 Rack Mounting Rail Kit

A set of mounting rails is available for use in 19 inch rack cabinets (Figure 2–3). These rails have been designed and tested to handle the maximum enclosure weight and to ensure that multiple FC60SS enclosures may be installed without loss of space within the rack. Use of other mounting hardware may cause some loss of rack space.

The rack mounting rail kit also incorporates a rear hold down mechanism to ensure shock and vibration immunity.

Please contact your supplier to ensure suitable mount rails are available for the rack you are using.

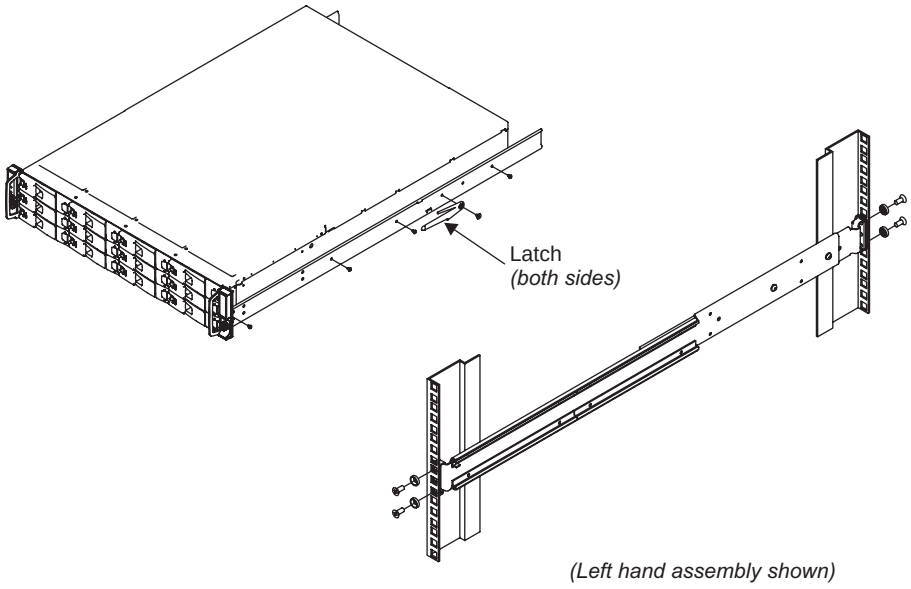


Figure 2–3 Rack Mounting Rail Kit

2.3.4 Rack Installation Procedure

Please refer to the detail drawings supplied with the rack mounting rail kit for further information

2.3.4.1 Parts Check List

Rack Mounting Rail Kit

2.3.4.2 Installation Procedure

1. Attache left and right chassis slides to the enclosure sides using 8 M3x4 button head screws (see Figure 2–4).

2. assemble the left and right chassis latches using the special chassis latch screws. Ensure that the latch is orientated as shown in Figure 2–4, with the spring arm located against its stop.On the right hand this is at the top, on the left it is at the bottom.

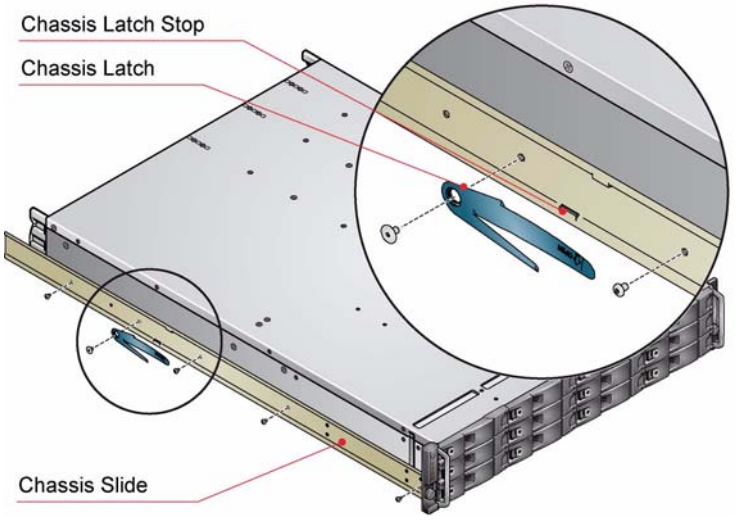


Figure 2–4 Securing Chassis Slides to Enclosure *(steps 1 & 2)*

3 Assemble to brackets (not handed) to rack as follows (refer to Figure 2–5):

a Locate the location pin at the rear of the rail into the rear rail post.

b Extend the rail to fit between the front and rear rack posts.

c Attach to both front and rear of the rack using the washers and screws supplied The screws should be left loose enough to allow for sideways movement of the rail.

d Tighten the two clamping screws.

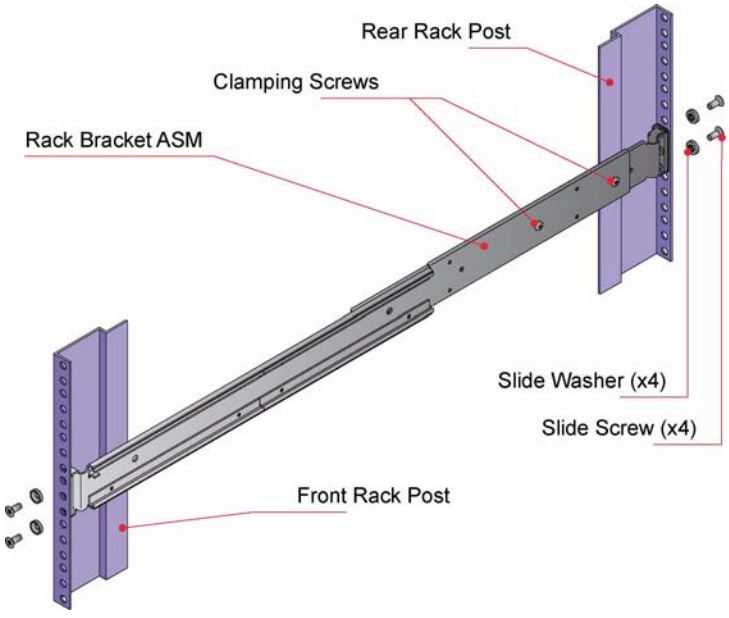


Figure 2–5 Securing Brackets to Rack - left hand assembly *(step 3)*

4 Mount the enclosure in the rack as follows (refer to Figure 2–6):

a Lift the enclosure and align it with the rack rails.

b Carefully insert the chassis slides into the rack rails and push fully home.

c Tighten the rear screws.

d Withdraw the enclosure until it reaches the hard stops (approximately 400mm).

e Return the enclosure to the fully home position and attach to the rack using the captive fasteners on the front flanges.

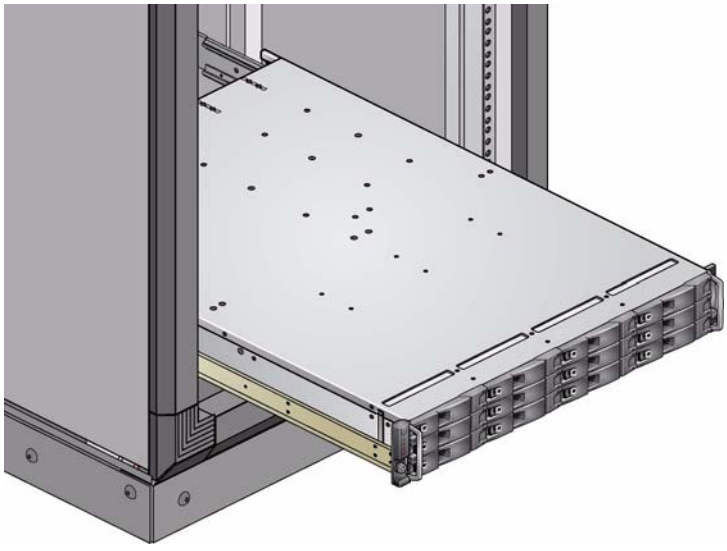


Figure 2–6 Mounting the Enclosure into a Rack *(step 4)*

2.3.5 Chassis Installation

2.3.5.1 Parts Check List

- Chassis (complete with Backplane, Ops Panel and all plug-in modules installed).
- Rack mounting thumbscrews (4 off).

2.3.5.2 Procedure

1 Fit the Rack Mounting Rail Kit in accordance with the mounting kit Installation procedure.

2 Check chassis for damage.

3 Slide the chassis assembly onto the rack rails until the front flanges engage on the rack. Ensure the chassis is centrally located.

4 If in doubt about correct orientation, the Operator's Panel should be on the left hand side of the enclosure.

5 Tighten the two mounting thumbscrews present on each chassis flange.

2.4 Module Installation

The FC60SS enclosure is supplied fully populated with all plug-in modules installed. For information on removal/replacement of plug-in modules, please refer to Chapter 4. , "Troubleshooting and Problem Solving", on page 47

2.5 Management Interfaces

The following management interfaces are provided and used to configure, manage and monitor the FC60SS RAID Module Storage Solution.

2.5.1 StorView ® Storage Management Software

StorView ® Storage Management software is a full-featured graphical HTML-based software suite designed to configure, manage and monitor the FC60SS RAID Module Storage Solution.

StorView provides the centralized local and remote management tool to control primary storage assets vital to ensuring maximum data reliability, network up-time, and system serviceability. It also allows you to manage and monitor the storage system from a host running StorView locally and from a web browser across the intranet or internet.

StorView comprises the StorView Server which runs as a background service and is responsible for managing the installed modules.

The StorView Server discovers system storage devices, manages and distributes message logs, and communicates with other StorView Servers installed on the same local and external subnet networks.

A GUI provides the interface in an HTML-based front end which is accessed using a web browser.

The software incorporates a web server, Apache 2.0, that provides the interface between the StorView Server and GUI. During installation the web server is automatically configured.

Please refer to the following documents:

- StorView Storage Manager Software Installation Guide
- StorView Storage Manager Software RAID Module User Guide

2.5.2 RAID Configuration Utility (Menu-based)

The FC60SS RAID module firmware based programs are accessed through a VT-100 terminal using a menu-based RAID Configuration Utility interface.

Please refer to the following document:

- Menu-based RAID Configuration Utility User Guide .

2.5.3 RAID Configuration Utility (Text-based)

The FC60SS RAID module firmware based programs are accessed through a VT-100 terminal using a text-based RAID Configuration Utility interface.

Please refer to the following document:

- Text-based RAID Configuration Utility User Guide

2.6 Enclosure Configuration

FC60SS enclosures are configured with one internal domain of 12 drives per FC60SS RAID module.

2.7 Fibre Channel Interface

The FC60SS RAID module provides two Fibre Channel SFP interface connections.

The FC60SS RAID module provides bi-directional connection between the Fibre Channel host side interface and the drives.The drives will not be presented to the Host until they are configured and mapped by the controller.

Note There are no external terminators required with Fibre Channel architecture and any drive may be hot plugged during operation.

Each FC60SS RAID module can be connected to up to 2 independent Host Bus Adaptors or switch ports. Some typical configurations utilizing two FC60SS RAID modules and either one or two HBAs are shown in Figure 2–7 to Figure 2–13 inclusive:

Important **Optical modules must be UL (or other North American NRTL) RECOGNISED COMPONENT and the laser in the module must comply with Laser Class 1, US 21 CFR (J) and EN 60825-1.**

Please contact your supplier for a list of qualified optical SFP components.

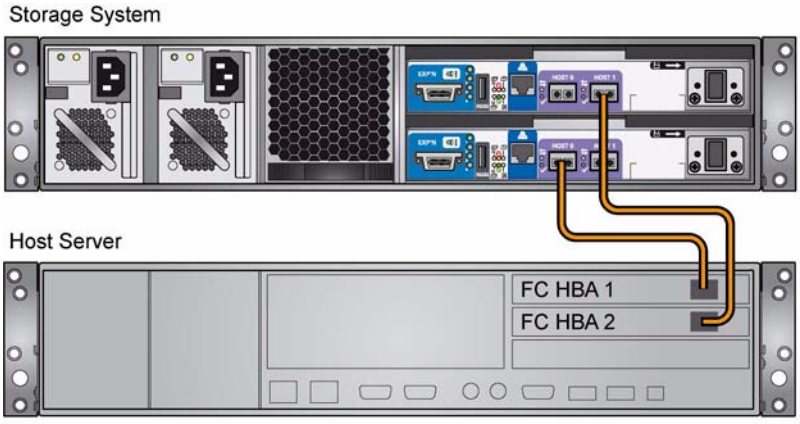


Figure 2–7 Single Host Dual Controller Connections

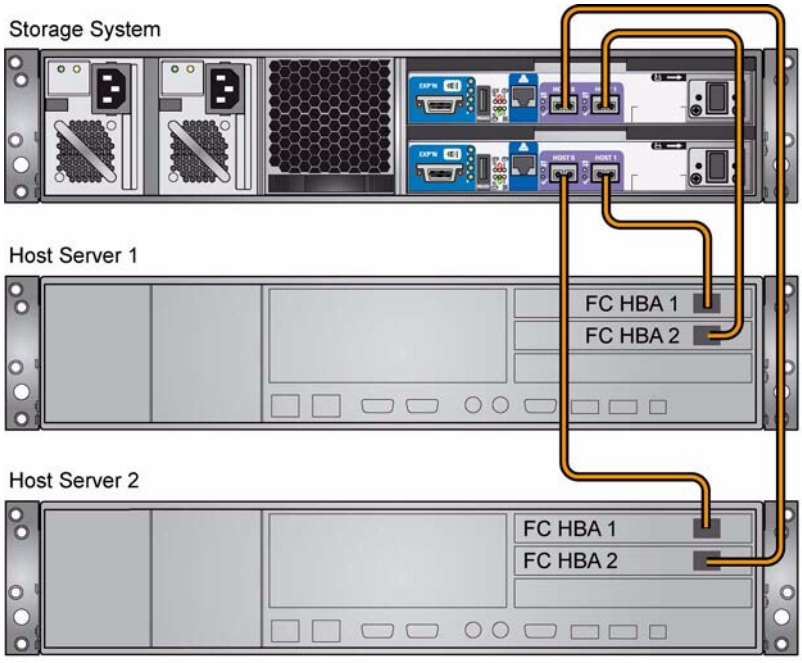


Figure 2–8 Dual Host Dual Controller Connections

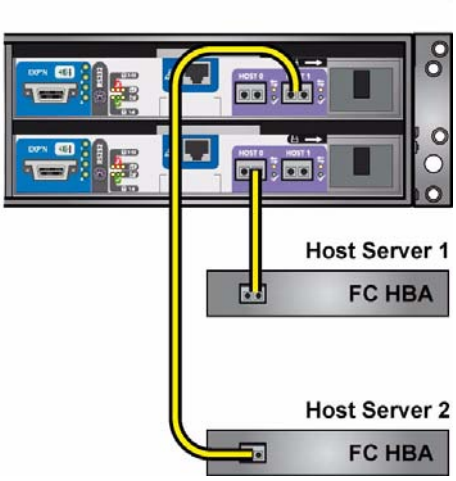


Figure 2–9 Dual Host Dual Controller Connections (Single HBA)

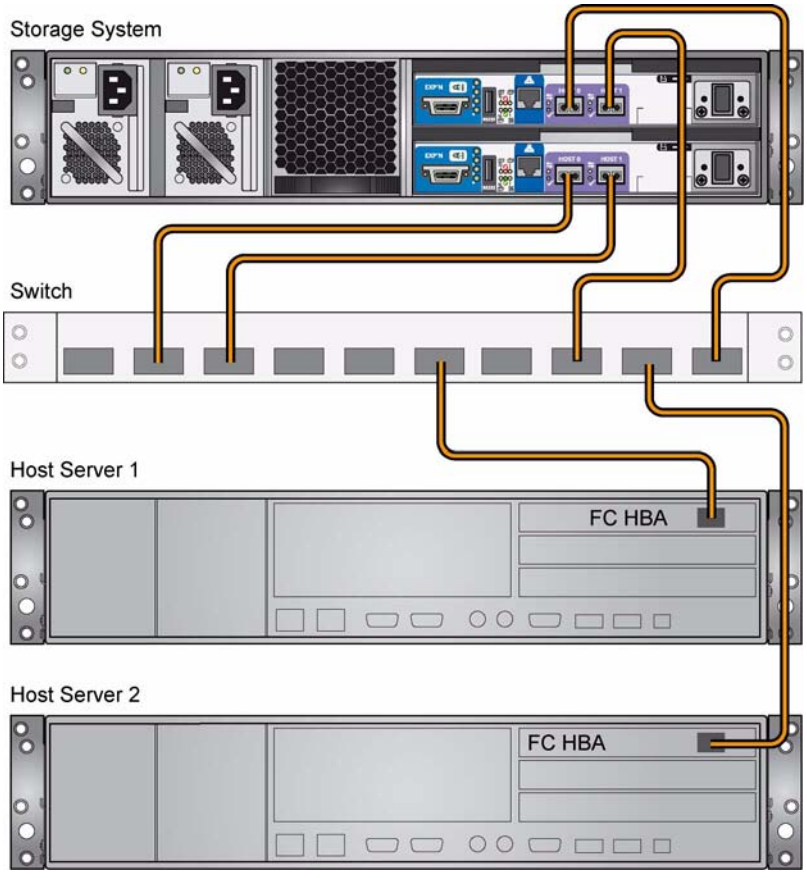


Figure 2–10 Dual Host Dual Controller and Single Switch Connections (Dual HBA)

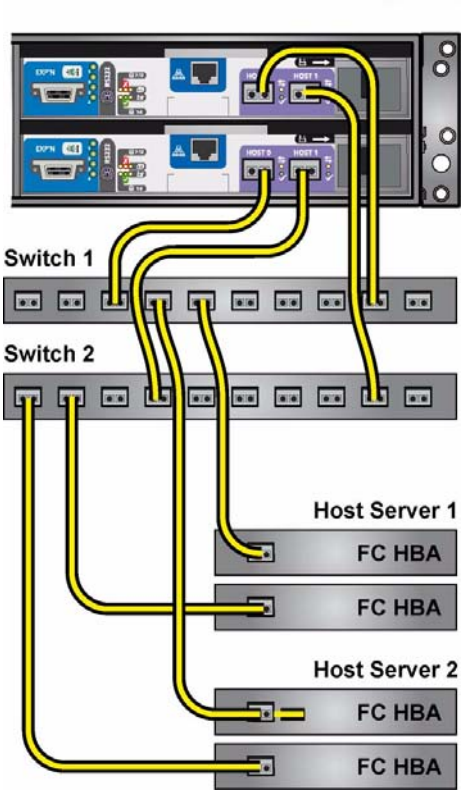


Figure 2–11 Dual Host Dual Controller and Dual Switch Connections

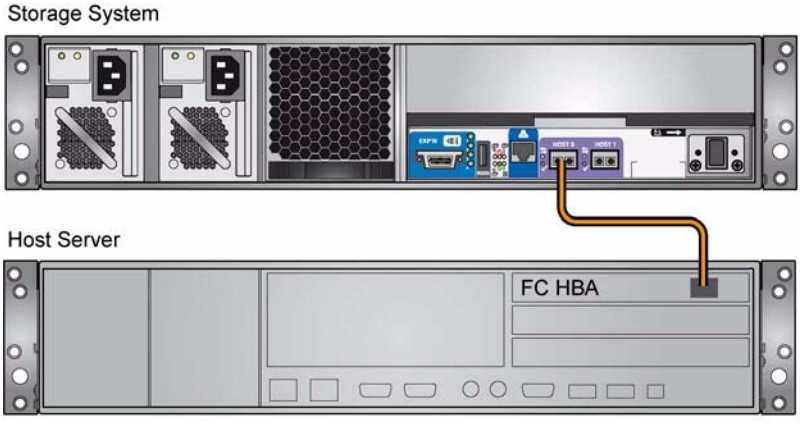


Figure 2–12 Single Host Single Controller Connections

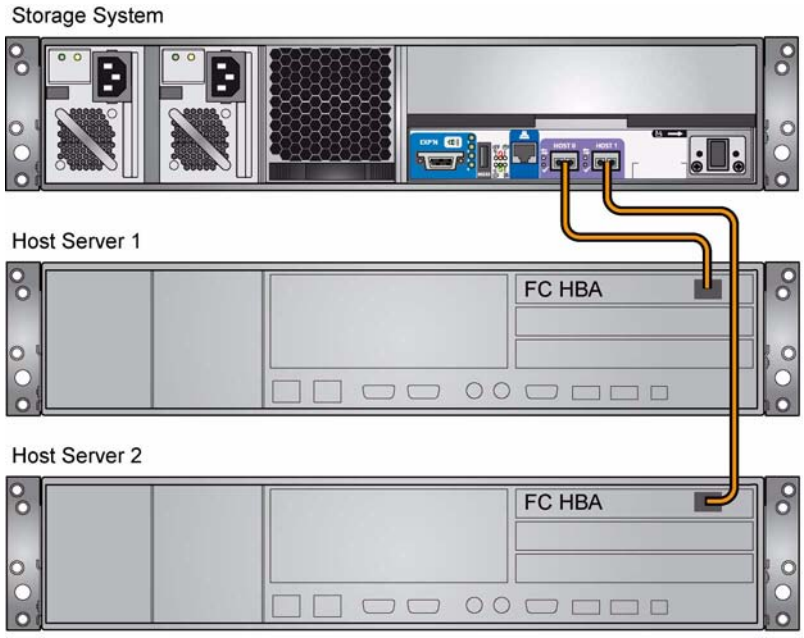


Figure 2–13 Dual Host Single Controller Connections

2.8 Ethernet Connection

An RJ45 10/100BaseT Ethernet port allows the controller to be connected to a network to enable out-of-band management and monitoring using the Embedded Storview GUI software.

Ensure that the PC is connected either directly or via a switched LAN to the Ethernet.

Important **Only screened twisted pair Ethernet cable must be used for connection to the Ethernet port.**

2.9 Enclosures Expansion

Additional expansion enclosures, e.g.FC60SS-XPN enclosures, can be connected to a FC60SS enclosure. Multiple enclosures are connected together using SAS patch cables, up to a maximum of 5 enclosures, a typical configuration is shown in Figure 2–14.

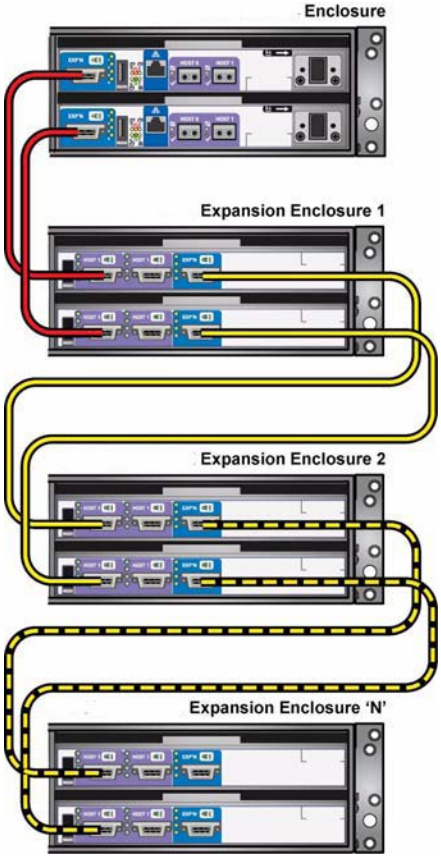


Figure 2–14 FC60SS Enclosure Expansion Configuration

2.10 Drive Slot Arrangement

Each enclosure has 12 drives which are referenced by their location as shown in Table 2–2. Drives are numbered column/row.

Table 2–2 Drive Slot Arrangement: Enclosure Front View

Column/row	1/#	2/#	3/#	4/#
#/1	**Drive 1**	**Drive 2**	**Drive 3**	**Drive 4**
#/2	**Drive 5**	**Drive 6**	**Drive 7**	**Drive 8**
#/3	**Drive 9**	**Drive 10**	**Drive 11**	**Drive 12**

2.10.1 Drive Location Rules

The FC60SS and FC60SS-XPN enclosure systems support two different types of disk drive, SAS and SATA. In order to allow optimal configurations to be built, the following rules should be observed:

1 Different drive types (i.e.SAS and SATA) cannot be mixed in the same column, i.e.
- Slots 1, 5, 9 = column 1
- Slots 2, 6, 10 = column 2
- Slots 3,7,11 = column 3
- Slots 4, 8, 12 = column 4

(see Table 2–2 for slot arrangement).

2 To achieve optimum performance drives should be populated in the following location sequence
- slots **2, 6** and **10** initially,
- followed by slots **3, 7, 11**
- then slots **1, 5, 9**
- and finally slots **4, 8, 12,** i.e.

Drive Location Sequence (1)

Column/row	1/#	2/#	3/#	4/#
#/1	-	**2**	-	-
#/2	-	**6**	-	-
#/3	-	**10**	-	-

Drive Location Sequence (2)

Column/row	1/#	2/#	3/#	4/#
#/1	-	**2**	**3**	-
#/2	-	**6**	**7**	-
#/3	-	**10**	**11**	-

Drive Location Sequence (3)

Column/row	1/#	2/#	3/#	4/#
#/1	1	2	3	-
#/2	5	6	7	-
#/3	9	10	11	-

Drive Location Sequence (4)

Column/row	1/#	2/#	3/#	4/#
#/1	1	2	3	4
#/2	5	6	7	8
#/3	9	10	11	12

3 If a change in drive technology is required then a new column of drives should be populated, e.g.

Column/row	1/#	2/#	3/#	4/#
#/1	-	SAS 2	SATA 3	-
#/2	-	SAS 6	SATA 7	-
#/3	-	-	SATA 11	-

All members of the column should maintain the same drive type.

2.10.2 Drive Start

With two active PSUs all drives start immediately.

2.10.3 Engaging the Anti-tamper Locks

The anti-tamper locks are fitted in the drive carrier handles and are accessed through the small cutout in the latch section of the handle.

Drives are supplied with the locks set in the locked position.

2.10.3.1 Activating the Locks

1 Carefully insert the lock key provided into the cutout in the handle.

2 Locate the key into its socket.

3 Rotate the key in a clockwise direction until the indicator is visible in the aperture beside the key.

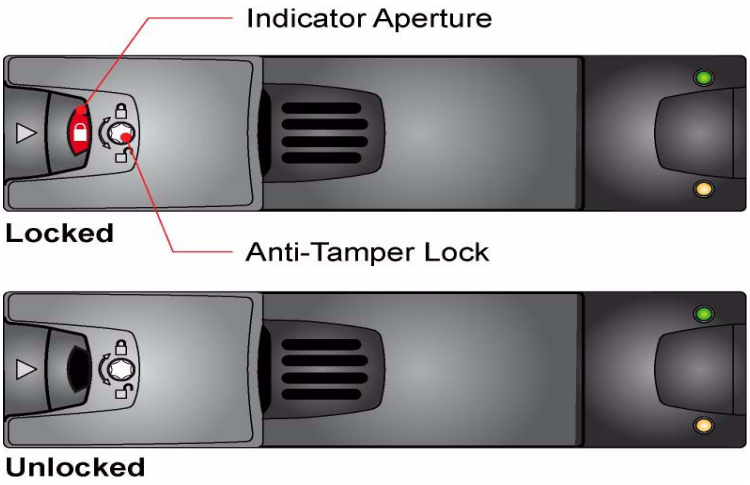


Figure 2–15 Activating the Anti-tamper Lock

4 Remove the key.
De-activation is the reverse of this procedure, that is:

- Rotate the key in an anti-clockwise direction until the indicator is no longer visible in the aperture beside the key.

Note A drive carrier cannot be installed if its anti-tamper lock is activated outside the Enclosure.

2.11 Power Cord Connection

2.11.1 Parts Check List

- Power cord to requisite local standards

2.11.2 Procedure

1 Attach the power cord to the Power Supply modules,

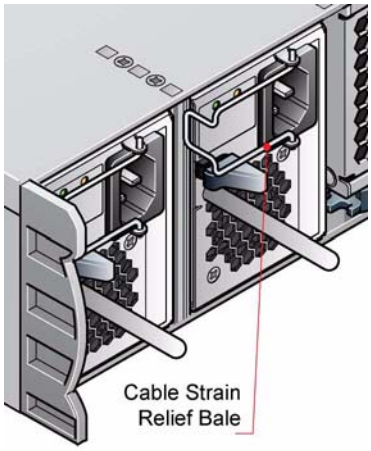


Figure 2–16 Cable Strain Relief Bales

2 Attach the power cord to the Power Distribution Unit (Figure 2–17) in the rack or other power source.

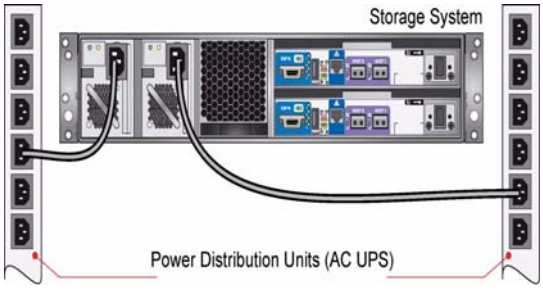


Figure 2–17 Power Cord Connections

Warning **Before applying power, carry out the grounding checks detailed in section 2.12.**

3 A Power On LED on the Ops Panel indicates whether AC power is present.

Caution *The power connections must always be disconnected prior to removal of the Power Supply module from the enclosure.*

2.12 Grounding Checks

Perform these checks to ensure that a safe grounding system is provided.

- If a Rack Distribution System is being used.
  - Ensure power is removed from the rack.
  - Connect the FC60SS power cord to the rack distribution and the enclosure.
- If a direct connection is made with the FC60SS power cord, ensure that it is connected to the enclosure.

Warning **Some electrical circuits could be damaged if external signal cables or power control cables are present during the grounding checks.**

- Check for continuity between the earth pin of the IEC 320 connector on one of the Power Supply modules and any exposed metal surface of the FC60SS enclosure.

2.13 Embedded StorView Initial Setup

If this is the first startup of the Embedded StorView module, you will probably need to configure the network settings.The Embedded StorView module supports both DHCP and manual network settings. By default the Embedded StorView module will look for a DHCP server to obtain an IP address. If one is not found, it will search to determine if an IP address had been previously assigned. If an address was not previously assigned, then the system defaults to an IP address of:

- 10.1.1.5 for the lower RAID Controller (Controller 0)
- 10.1.1.6 for the upper RAID Controller (Controller 1)
- 10.1.1.7 if an error is detected
- Subnet Mask is 255.0.0.0

A tool is provided to configure new Embedded StorView modules. From Windows platforms it is access via the Embedded link on the disc navigation menu and on Linux it is accessed via a command line executable.

When the Embedded StorView Setup program is run, it will broadcast UDP packets and any Embedded StorView module will reply with UDP packets containing their information. A list of “uninitialized” systems is displayed. Uninitialized systems are those which have not had the default user name and password changed. Even if a configuration is created with arrays and logical drives but the login name and password have not been changed, it will still be considered an uninitialized system During the process of configuring an Embedded StorView module, you will be required to enter a “new’ password and confirm that password. The default password is “password.”

The Embedded StorView module is identified by its MAC and IP address. It may be more helpful during setup to configure one Embedded StorView module at a time.You will find the MAC address located on a label affixed to the top of the controller case or by accessing the VT-100 text-based menu function for Embedded StorView Menu mode and viewing the network settings. Note the specific address of each controller in multiple controller environments and the location where that specific controller is installed in the enclosure.

2.13.1 Setting up the Embedded StorView Module: Microsoft Windows

1. Insert the Software and Manuals CD into your CD drive. the autorun program will automatically start the navigation menu, click on the link for the hardware (FC60SS) product which you have installed.

2. Click the **Embedded StorView Setup** link to begin the Setup Wizard.

3. You are presented with a Welcome screen and instructions to proceed. Review the information and click the **Next** button. (Figure 2–18)

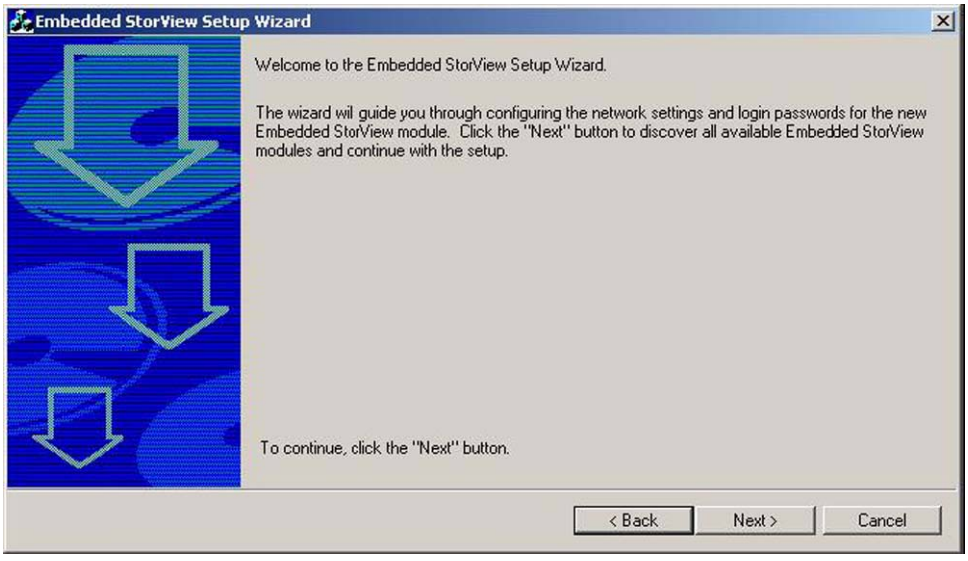

Embedded StorView Setup Wizard
Welcome to the Embedded StorView Setup Wizard.
The wizard wil guide you through configuring the network settings and login passwords for the new Embedded StorView module. Click the "Next" button to discover all available Embedded StorView modules and continue with the setup.
To continue, click the "Next" button.
< Back
Next >
Cancel

Figure 2–18 Welcome Screen

4 T he program will begin searching for Embedded StorView modules (Figure 2–19).

Those embedded modules with their default password intact will be displayed with their MAC address in an Uninitialized list window. If all discovered embedded modules have had their default passwords changed, then you will be taken to the Initialized screen.

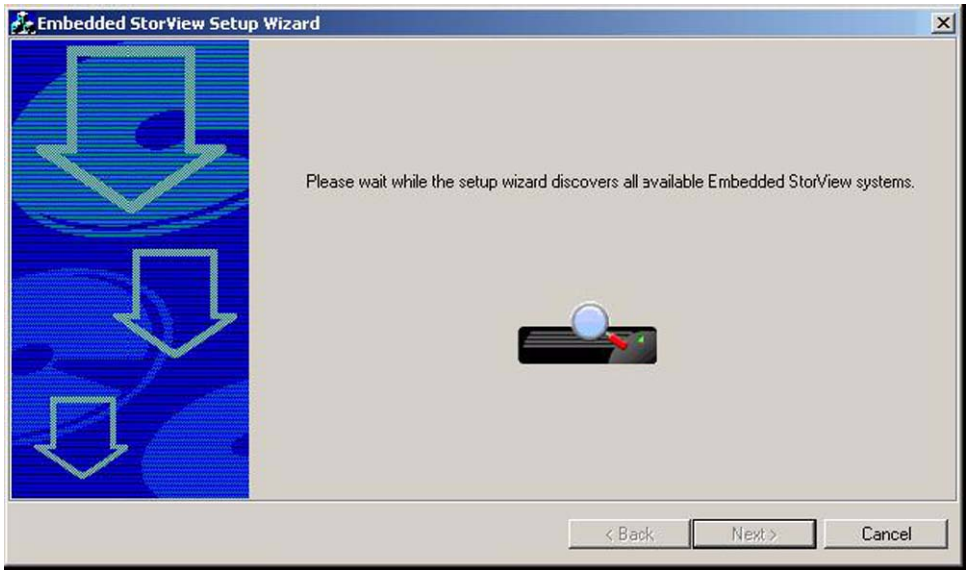

Embedded StorView Setup Wizard
Please wait while the setup wizard discovers all available Embedded StorView systems.
< Back
Next >
Cancel

Figure 2–19 Search Screen

5 From the Uninitialized screen (Figure 2–20), select the MAC address of the embedded module you wish to configure.If you wish to use a DHCP server to assign your IP address, click the check box “Use DHCP.”

If you wish to manually configure your network setting, enter the correction information in the appropriate fields.

Enter a new" password and confirm the new password. Click the **Configure** button.

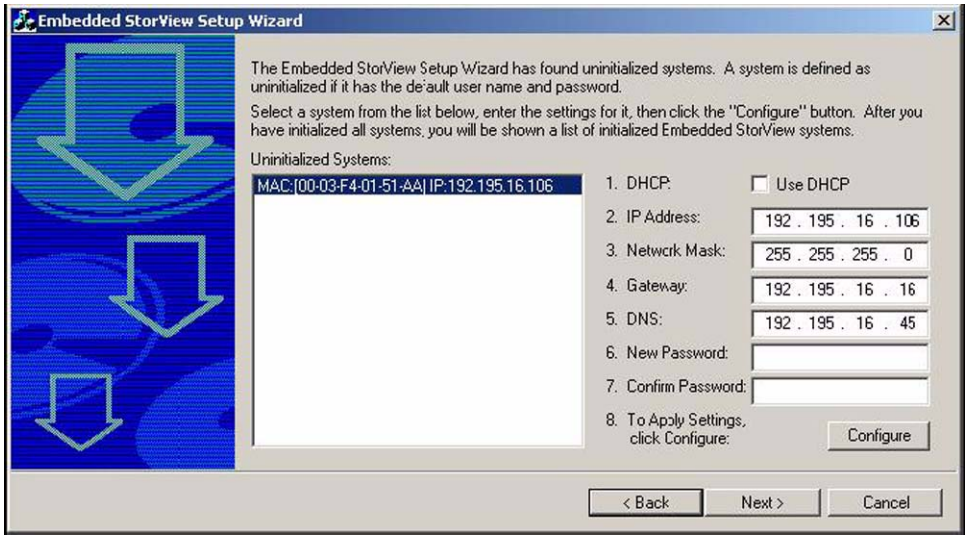

Embedded StorView Setup Wizard
The Embedded StorView Setup Wizard has found uninitialized systems. A system is defined as uninitialized if it has the de'ault user name and password.
Select a system from the list below, enter the settings for it, then click the "Configure" button. After you have initialized all systems, you will be shown a list of initialized Embedded StorView systems.
Uninitialized Systems:
MAC:[00-03-F4-01-51-AA] IP:192.195.16.106
1. DHCP:
Use DHCP
2. IP Address:
192 . 195 . 16 . 106
3. Netwcrk Mask:
255 . 255 . 255 . 0
4. Gateway:
192 . 195 . 16 . 16
5. DNS:
192 . 195 . 16 . 45
6. New Password:
7. Confirm Password:
8. To Apply Settings, click Configure:
Configure
< Back
Next >
Cancel

Figure 2–20 Configuration Screen

6 if you have additional uninitialized embedded modules, select the next MAC address and choose the appropriate settings from the previous step.

Once you have completed configuring all the uninitialized embedded modules and have clicked the Configure button, the wizard will display a popup message indicating all systems have beenconfigured.It will then re-scan for systems and if none are found, you will be taken to the Initialized screen.

If someone plugs in a uninitialized module system to the network (same subnet mask) during the time of the rescan or resets a system's password back to the defaults, you will be taken to the Uninitialized screen again.

7 Select the MAC address of the embedded module you wish to start and click the **Launch StorView** button. (Figure 2–21)

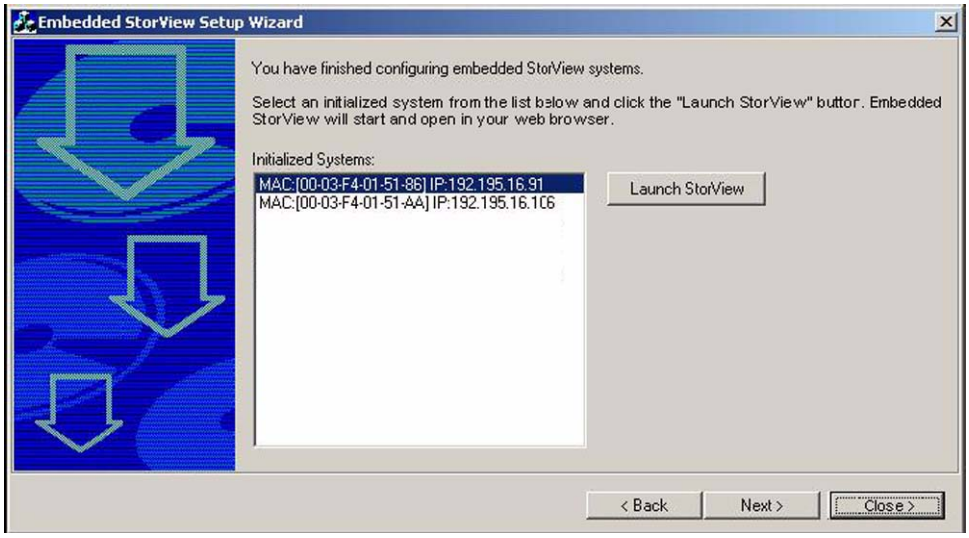

Embedded StorView Setup Wizard
You have finished configuring embedded StorView systems.
Select an initialized system from the list below and click the "Launch StorView" buttor. Embedded StorView will start and open in your web browser.
Initialized Systems:
MAC:[00-03-F4-01-51-86] IP:192.195.16.91
MAC:[00-03-F4-01-51-AA] IP:192.195.16.106
Launch StorView
< Back
Next >
Close

Figure 2–21 Launch Screen

8 Your default web browser will open with a login screen. Enter the login name and “new” password then click **OK**. The StorView Main screen will open.

2.13.2 Setting up the Embedded StorView Module: Linux

1 Log in as “root.”

2 Insert the Software & Manuals Disc into your CD drive.

3 Change directories to the software location. Type:

```
cd [CDROM mount point path]/software/ storview/embedded
```

4 Execute the Embedded StorView Setup Tool. From the command prompt, type:

```
./esvsetupcl-linux
Embedded StorView Setup Tool. v1.0
Entering Menu Mode.
```

5 Follow the on screen prompts. At the conclusion of the setup you will be instructed on how to proceed.

Chapter 3
Operation

3.1 Before You Begin

Before powering up the FC60SS enclosure please ensure that all the modules are firmly seated in their correct bays.

3.2 Power On

Power on the enclosure by connecting cables to the PDU, or powering on the PDU, then power on the Host system.

Caution *Do not operate this equipment until the ambient temperature is within the specified operating range. If the drives have been recently installed ensure they have had time to acclimatize before operating them.*

Note Please refer to Section 3.5 for details of the Ops Panel LEDs and related fault conditions.

Follow the procedure below to Power On the enclosure.

1 Apply AC power to the enclosure.

2 The Power On LED on the Ops Panel should be lit (Green) when the enclosure power is activated (and the disk drive motors should start).

Note The Power On LED on the Ops Panel should be lit Green at power up to indicate that the system is functioning correctly, all other Ops Panel LEDs are off. If any LEDs show Amber then a problem exists and the procedure in Chapter 4 should be followed.

Important **If AC power is lost for any reason, on restoration of power the enclosure will re-start automatically.**

3.3 Power Supply Module LEDs

The Power Supply module incorporates 2 LEDs.

- Under Normal conditions the Power On LED should be illuminated constant GREEN
- If a problem is detected the Module Fault LED will be illuminated constant AMBER.

The Power Supply module LED states are detailed in Table 3–1.

Table 3–1 Power Supply LEDs

Power On & OK (Green)	Module Fault (Amber)	Status
Off	Off	No AC power (either PSU)
Off	On	No AC power (this PSU only)
Off	On	PSU Fault (over temp, over voltage, over current, PSU fan fail)
On	Off	AC present, PSU on and OK
On	On	Fan Fault

3.4 Cooling Module LED

The Cooling module incorporates a Module Fault LED (Amber), defined in Table 3–2).

Table 3–2 Cooling Module LED

Status	Module Fault (Amber)
Enclosure On - Fan OK	Off
Fan Fail	**On**

3.5 Ops Panel LEDs

The Ops Panel LEDs are shown in Figure 3–1 and the LEDs status conditions are defined in Table 3–3.

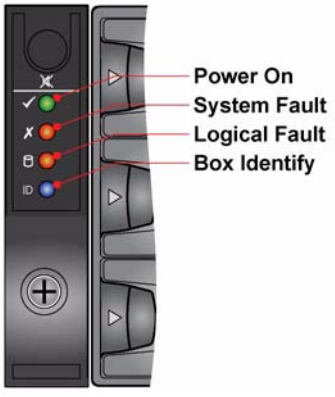


Figure 3–1 Ops Panel LEDs and Switches

Important **Chapter 4, "Troubleshooting and Problem Solving", on page 47 provides more information.**

Table 3–3 Ops Panel LED States

Ops Panel LEDs				Other Associated LEDs or Alarms	State Description
Power On ***(Green/ Amber)***	**System Fault** ***(Amber)***	**Logical Fault** ***(Amber)***	**Box Identify** ***(Blue)***		
	Off	***Off***	***X***		Aux present, overall power failed or switched off.
On	***On***	***On***	***On***	single beep, two double beep	Ops Panel power on (5s) test state
On	***Off***	***X***	***X***		Power On, all functions good
On	***On***	***X***	***X***	PSU Fault LED or Cooling Module Fault LED	Any PSU Fault or Fan Fault Over or Under temperature
On	***On***	***X***	***X***	FC60SS RAID Controller Fault LED on lower controller	ESI processor/ FC60SS RAID Controller 0 failed
On	***On***	***X***	***X***	FC60SS RAID Controller Fault LED on upper controller	ESI processor/ FC60SS RAID controller 1 failed
On	***Flashing***	***X***	***X***	FC60SS RAID Controller Fault LED	• Unknown (invalid or mixed) module type installed, *or* • 12C Bus Failure (inter ESI processor).
On	***Flashing***	***X***	***X***	PSU Removed:	PSU removed when two were present at Start of Day
On	***(X)***	***Off***	***X***		Power On, all functions good
On	***(X)***	***On***	***X***	Array in failed or degraded state:	Drive failure has occurred causing loss of availability or redundancy.
On	***(X)***	***Flashing***	***X***	Arrays in impacted state:	Arrays performing background function
X	***X***	***X***	***On***		SES controlled enclosure identify.

Note: "X" = no bearing on these states

3.6 FC60SS RAID Module LEDs

The FC60SS RAID module LEDs status conditions are defined in Table 3–4.

Table 3–4 FC600SS RAID Module LEDs

LED Functions	LED State	Definition
Controller Slot 0 Activity*	Amber	When ON the Controller is currently processing data
Controller Slot 1 Activity*	Amber	When ON the Controller is currently processing data
Controller OK	Green	Module OK
Controller Fault	Amber	Fault on this module
Cache Active	Amber	Active cache contents
Battery/Controller Fail	Amber	Fault in battery or charger operation of controller
Host 0 Port Signal Good	Green	When ON the LED denotes that incoming FC signal is good
Host 1 Port Signal Good	Green	When ON the LED denotes that incoming FC signal is good
Host 0 Port Traffic*	Amber	When ON the Controller is processing data on this port
Host 1 Port Traffic*	Amber	When ON the Controller is processing data on this port
SAS Expansion 1*	Green	When ON this port is active
SAS Expansion 2*	Green	When ON this port is active
SAS Expansion 3*	Green	When ON this port is active
SAS Expansion 4*	Green	When ON this port is active

* These LEDs blink on/off when there is module activity.

3.7 Disk I/O Module LEDs

Table 3–5 Disk I/O Module LEDs

LED Functions	State	Description
Host 0 & Host 1 **(Green)**	ON Flashing OFF	Ready Active Not Ready
Expansion **(Green)**	ON Flashing OFF	Ready Active Not Ready

3.8 Starting the Drives

Unless otherwise selected during installation, all drives in the enclosure should automatically start their motors. If this has not occurred one of the following conditions may exist:

- There may be a power problem (an alarm and power fault indication would normally be active).
- If there is only one Power Supply Module present, the drive motors will spin up in a delayed sequence.

3.8.1 Disk Drive LEDs

Each drive carrier incorporates two indicators, an upper (GREEN) and lower (AMBER).

- In normal operation the Green LED will be ON and will flicker as the drive operates.
- The Amber LED will be OFF In normal operation. It will only be ON if there is a drive fault.
- If the Green LED is OFF when the Amber LED is ON, a power control circuit failure is indicated.

3.9 Starting StorView

Upon start-up, embedded StorView looks at the user Preferences Settings to determine if an IP address exists. If one is defined it will initialize the network interface using that IP address. In the event an IP address is not defined, it attempts to get a DHCP IP address. You will need to contact your network administrator for the IP address assigned by the DHCP server. To identify the new IP address lease, one can look for *'esv0'* or *'esv1'* in your DHCP Manager software. If an IP address cannot be determined, the software will use a default IP address of “10.1.1.5” for Controller 0 and “10.1.1.6” for Controller 1. If an error is encountered, it will assign the Embedded StorView Server the IP address “10.1.1.7.”

- The first time you start StorView, you will need to configure the network settings. On the first startup, you will be prompted for a user name and password. The default user name is *“admin”* and the default password is *“password.*”. you should change your password to protect your array, please refer to the Storview User Guide.

3.10 Power Down

The enclosure can be powered down at any time and if cached contents are present (refer to the Cache Active LED on the RAID module), they will be preserved by the internal battery. If the enclosure is left in this state for extended periods then the batteries will discharge and the cached data will be lost. It is therefore recommended that, especially if the unit is to be powered down for extended periods, the controller is shut down prior to powering off the enclosure.This will ensure that the cache is flushed to disc and will prevent the battery from being discharged. Discharged batteries may also result in reduced performance when the array is again powered up, because the write-back cache will be disabled until the batteries are fully charged.

1 Shut down is requested at the GUI interface, please refer to StorView Storage Manager Software RAID Module User Guide.

2 To power the Enclosure down, remove AC power at the power source.

Chapter 4

Troubleshooting and Problem Solving

4.1 Overview

FC60SS enclosures include a processor and associated monitoring and control logic to enable them to diagnose problems within the enclosure's power, cooling and drive systems.

The sensors for power and cooling conditions are housed within the Power Supply modules. There is independent monitoring for each unit.

If a fault is indicated on the Ops Panel, please refer to Table 4–3.

4.1.1 Initial Start-up Problems

4.1.1.1 Faulty Cords

First check that you have wired up the subsystem correctly. Then, if:

- cords are missing or damaged
- plugs are incorrect
- cords are too short

Call your supplier for a replacement.

4.1.1.2 Alarm Sounds On Power Up

Please refer to Section 4.3.

4.1.1.3 Green "Signal Good" LED on FC60SS RAID Module Not Lit

Check that the Rx and Tx cables have not been reversed during installation. Also check that the SFP is properly seated and that the ends of optical cables are clean and undamaged. If the condition persists, try replacing the SFP and/or cables.

4.1.1.4 Computer Doesn't Recognize the FC60SS Enclosure

1 Check that the FC interface cables from the FC60SS enclosure to the host computer are fitted correctly.

2 Check that all drive carrier modules have been correctly installed and that the LEDs on all installed drive carrier modules are illuminated Green. Note that the drive LEDs will not be lit during drive spinup.

3 Check that there is a valid FC_AL signal present at the FC60SS connector by observing the state of the LEDs Host Port 0 Signal Good and Host Port 1 Signal Good (see Figure 1–11 on page 10 and Table 4–4 on page 51). If there is no signal present check that the cable has not been inverted during installation. A green LED indicates that the signal is present. If there is no signal present see section 4.1.1.3 on page 47.

4 Check the FC60SS RAID module setup as follows:
- Check that the FC60SS RAID module has been correctly installed and all external links and cables are securely fitted.
- Check that the maximum cable length has not been exceeded.

5 Check that the FC60SS RAID module is properly set up at the Management Interface.

Important: **For details on how to remove and replace a plug-in module see Section 4.8.**

4.2 Status Indicators (LEDs)

- Green LEDs are always used for good or positive indication.
- LEDs Flashing Green or Flashing Amber indicate that non-critical conditions exist.
- Solid Amber LEDs indicate there is a critical fault present within the module.

4.2.1 Power Supply Module LEDs

The Power Supply LED states are detailed in Table 4–1.
- Under Normal conditions the Power On LED should be illuminated constant GREEN
- If a problem is detected the Module Fault LED will be illuminated constant AMBER.

Table 4–1 Power Supply LEDs

Power On & OK (Green)	Module Fault (Amber)	Status
Off	Off	No AC power (either PSU)
Off	On	No AC power (this PSU only)
Off	On	PSU Fault (over temp, over voltage, over current, PSU fan fail)
On	Off	AC present, PSU on and OK
On	On	Fan Fault

4.2.2 Cooling Module LED

The Cooling module incorporates a Module Fault LED (Amber), defined in Table 4–2).

Table 4–2 Cooling Module LED

Status	Module Fault (Amber)
Enclosure On - Fan OK	Off
Fan Fail	**On**

4.2.3 Ops Panel LEDs

The Ops Panel displays the aggregated status of all the modules. The Ops Panel LEDs are shown in Figure 4–1 and defined in Table 4–3.

Note The Ops Panel is supplied as an integral part of the enclosure core product and is not user replaceable.

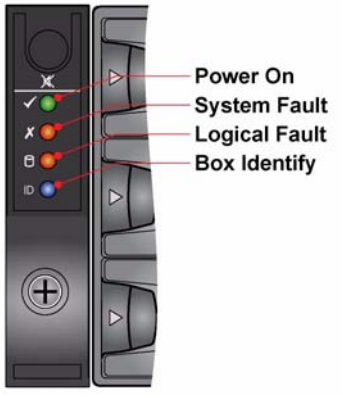


Figure 4–1 Ops Panel

Table 4–3 Ops Panel LED States

Ops Panel LEDs				Other Associated LEDs or Alarms	State Description
Power On (*Green/ Amber*)	**System Fault** (*Amber*)	**Logical Fault** (*Amber*)	**Box Identify** (*Blue*)		
	Off	***Off***	***X***		Aux present, overall power failed or switched off.
On	***On***	***On***	***On***	single beep, two double beep	Ops Panel power on (5s) test state
On	***Off***	***X***	***X***		Power On, all functions good
On	***On***	***X***	***X***	PSU Fault LED or Cooling Module Fault LED	Any PSU Fault or Fan Fault Over or Under temperature
On	***On***	***X***	***X***	FC60SS RAID Controller Fault LED on lower controller	ESI processor/ FC60SS RAID Controller 0 failed
On	***On***	***X***	***X***	FC60SS RAID Controller Fault LED on upper controller	ESI processor/ FC60SS RAID Controller 1 failed
On	***Flashing***	***X***	***X***	FC60SS RAID Controller Fault LED	• Unknown (invalid or mixed) module type installed, *or* • 12C Bus Failure (inter ESI processor).
On	***Flashing***	***X***	***X***	PSU Removed:	PSU removed when two were present at Start of Day
On	***(X)***	***Off***	***X***		Power On, all functions good
On	***(X)***	***On***	***X***	Array in failed or degraded state:	Drive failure has occurred causing loss of availability or redundancy.
On	***(X)***	***Flashing***	***X***	Arrays in impacted state:	Arrays performing background function
X	***X***	***X***	***On***		SES controlled enclosure identify.

Note **"X"** = no bearing on these states

4.2.4 FC60SS RAID Module LEDs

The FC60SS RAID module incorporates the following LED indicators: For details on how to remove and replace a FC60SS RAID module see Section 4.11.

Table 4–4 FC60SS RAID Module LEDs

LED Functions	LED State	Definition
Controller Slot 0 Activity*	Amber	When ON the Controller is currently processing data
Controller Slot 1 Activity*	Amber	When ON the Controller is currently processing data
Controller OK	Green	Module OK
Controller Fault	Amber	Fault on this module
Cache Active	Amber	Active cache contents
Battery/Controller Fail	Amber	Fault in battery or charger operation of controller
Host 0 Port Signal Good	Green	When ON the LED denotes that incoming FC signal is good
Host 1 Port Signal Good	Green	When ON the LED denotes that incoming FC signal is good
Host 0 Port Traffic*	Amber	When ON the Controller is processing data on this port
Host 1 Port Traffic*	Amber	When ON the Controller is processing data on this port
SAS Expansion 1*	Green	When ON this port is active
SAS Expansion 2*	Green	When ON this port is active
SAS Expansion 3*	Green	When ON this port is active
SAS Expansion 4*	Green	When ON this port is active

* These LEDs blink on/off when there is module activity.

4.2.5 Disk I/O Module LEDs

Table 4–5 Disk I/O Module LEDs

LED Functions	State	Description
Host 0 & Host 1 **(Green)**	ON Flashing OFF	Ready Active Not Ready
Expansion **(Green)**	ON Flashing OFF	Ready Active Not Ready

4.2.6 Drive Carrier LEDs

Please refer to Table 4–6 on page 52.

4.3 Audible Alarm

The enclosure subsystem includes an Audible Alarm which indicates when a fault state is present. The following conditions will activate the Audible Alarm:

- Fan Fault
- Voltage out of range
- Over temperature
- Thermal overrun
- System fault
- Logical fault
- PSU Fault
- Removal of 1 PSU
- Invalid cabling

4.3.1 Audible Alarm Mute

When the Audible Alarm sounds, it may be muted by pressing the Alarm Mute push-button, located on the enclosure front panel. Automatic muting will take place after two minutes if the mute switch is not manually operated.

When the alarm is muted it will continue to sound with short intermittent beeps to indicate that a problem still exists, It will be silenced when all problems are cleared. (See also Section 4.5.5 on page 55).

4.3.1.1 LED Test Mode

The Alarm Mute push-button can also be used to activate the self- test feature for the LEDs on the Ops Panel. The test is activated when you press the Mute push-button while no faults are present. While the test is running all LEDs will flash.

4.4 Drive Carrier Module Faults

Disk drive status is monitored by a green LED and an amber LED mounted on the front of each Drive Carrier module (see Figure 4–2), providing the following indications:

Table 4–6 Drive Carrier LED Functions

State	Green	Amber
No drive fitted	Off	Off
Drive Power ON	On	Off
Drive Activity	On/Blink off	Off
Drive Impacted	On	Blink

Table 4–6 Drive Carrier LED Functions

State	Green	Amber
Drive Fault	On	On
Power control circuit failure	Off	On

Notes **1** Drive Activity - LED may be off for a length of time during power up.

2 Impacted - any background service, e.g. initialization

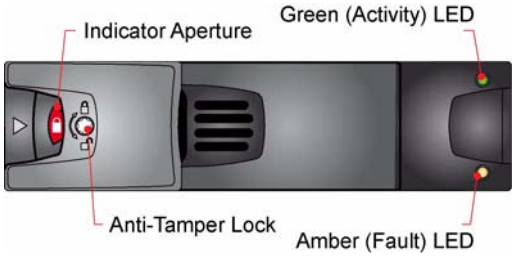


Figure 4–2 Drive Carrier LEDs

4.4.1 Auto Start Failure

Unless otherwise selected at installation time, all drives in the enclosure should automatically start their motors after power is applied. If this has not occurred there is a power problem (An alarm and power fault indication would normally be active).

4.5 Troubleshooting

The following sections describe problems, with possible solutions, which can occur with your FC60SS Enclosure Platform.

4.5.1 System Faults

Symptom	Cause	Action
1 The CONTROLLER FAULT LED will illuminate AMBER on the FC60SS module **2** Audible Alarm sound	The ESI processor has detected an internal fault on one of the following modules: – PSU – Cooling – FC60SS RAID	Replace faulty module as appropriate: – PSU – Cooling – FC60SS RAID

Note See also Section 4.5.5.

4.5.2 Power Supply Faults

Symptom	Cause	Action
1 Ops Panel SYSTEM FAULT LED AMBER **2** An AMBER LED on one or more Power Supply modules. **3** Audible Alarm sounding.	**1** Any power fault. **2** A fan failure. **3** A thermal condition which could cause PSU overheating. **4** Fault: on one of the following modules: – PSU – Cooling – FC60SS RAID **5** Removal of 1 PSU	**1** Check AC power connections to Power Supply module are live. **2** Disconnect the Power Supply module from AC power and remove the module from the system, Re-install: if problem persists, replace Power Supply Module. **3** Reduce the ambient temperature. **4** Replace faulty module as appropriate: – PSU – Cooling – FC60SS RAID

4.5.3 Thermal Control

FC60SS enclosures use extensive thermal monitoring and take a number of actions to ensure component temperatures are kept low and also to minimize acoustic noise. Air flow is from front to rear of the enclosure.

Symptom	Cause	Action
If the ambient air is cool (below 25 °C) and the fans are observed to increase in speed then some restriction on airflow may be causing additional internal temperature rise. **Note:** This is not a fault condition.	The first stage in the thermal control process is for the fans to automatically increase in speed when a thermal threshold is reached. This may be caused by higher ambient temperatures in the local environment and may be perfectly normal. **Note:** This threshold changes according to the number of drives and power supplies fitted.	**1** Check the installation for any airflow restrictions at either the front or rear of the enclosure. A minimum gap of 25mm at the front and 50mm at the rear is recommended. **2** Check for restrictions due to dust build-up, clean as appropriate. **3** Check for excessive re-circulation of heated air from rear to the front. Use in a fully enclosed rack installation is not recommended. **4** Check that all Blank modules are in place. **5** Reduce the ambient temperature.

4.5.4 Thermal Alarm

	Symptom	Cause		Action
1	Ops Panel SYSTEM FAULT LED AMBER.	**1**	If the internal temperature measured in the airflow through the enclosure exceeds a pre-set threshold a thermal alarm will sound.	**1** Check local ambient environment temperature is below the upper 40°C specification.
2	An AMBER LED on one or more Power Supply module.	**2**	Cooling Module failure	**2** Check the installation for any airflow restrictions at either the front or rear of the enclosure. A minimum gap of 25mm at the front and 50mm at the rear is recommended.
3	Audible Alarm Sounding.			**3** Check for restrictions due to dust build-up, clean as appropriate.
4	Air temperature exiting PSU above 55°C.			**4** Check for excessive re-circulation of heated air from rear to the front. Use in a fully enclosed rack installation is not recommended.
				5 If possible shutdown the enclosure and investigate the problem before continuing.
				6 Replace Cooling Module

4.5.5 Thermal Warnings

	Symptom	Cause	Action
1	ALL AMBER LEDs on the Ops Panel and on ALL drive bays illuminated flash.	At a higher threshold than the Thermal Alarm (this should already have been activated).	**1** Switch Off immediately.
			2 Check for airflow restrictions.
		OR - All fans have failed.	**3** Check Power Supply module faults.
2	Audible Alarm sounds almost continuously and cannot be muted.	OR - Only 1 fan operating and the internal temperature is 40° C or above.	**4** Check for excessive local temperatures.

4.6 Dealing with Hardware Faults

Ensure that you have obtained a replacement module of the same type *before* removing any faulty module.

Warning **If your FC60SS enclosure is powered up and you remove any module, replace it immediately. If the enclosure is used with plug-in modules, dummy carriers or blank modules missing for more than a few minutes, the Enclosure can overheat, causing power failure and data loss. Such use will invalidate the warranty.**

- Replace a faulty drive with a drive of the same type and equal or greater capacity.
- All drive bays must be fitted with a Drive Carrier or Dummy Carrier module in order to maintain a balanced air flow.
- All of the supplied plug-in power supply units, electronics modules, dummy carriers and blank modules must be in place for the air to flow correctly around the cabinet.

4.7 Continuous Operation During Replacement

Depending on how the FC60SS enclosure is configured, if a disk unit fails, it can normally be replaced without interrupting the use of the system.

In addition, each enclosure contains two Power Supply modules, either of which can maintain power and cooling to the subsystem while the other is replaced.

Note: The PSU replacement time must be as short as possible as the FC60SS enclosure is designed to operate with two PSUs installed.

Important **The fans within the Cooling module are not user replaceable, in the event of a cooling fan failure the complete Cooling module must be replaced.**

4.7.1 Ops Panel

Important **The Ops Panel is an integral part of the enclosure assembly and can only be replaced with a replacement enclosure. The enclosure should only be replaced by trained personnel.**

4.8 Replacing a Module

Warning **Whenever replacing a module NEVER leave an EMPTY space in the rear of the enclosure, obtain a replacement before removing the problem part.**

Please refer to Chapter 2 , ”Getting Started” for information on the initial installation of the plug-in modules in the FC60SS enclosure.

Warning **Observe all conventional ESD precautions when handling FC60SS modules and components. Avoid contact with Backplane components and module connectors, etc.**

4.9 Power Supply Modules

Warning **The FC60SS enclosure must only be operated with two Power Supply modules installed.**

4.9.1 Removing a Power Supply Module

Warning **Do not remove the faulty Power Supply module unless you have a replacement unit of the correct type ready for insertion. the system must not be operated without both PSUs in place.**

As there should always be two power supply units installed, you can continue working while replacing the faulty module.

1. Make sure you identify the faulty Power Supply module correctly, from the two modules installed.The Module Fault LED on the faulty PSU will be illuminated Amber.
2. Switch off the PSU and disconnect the power cord.
3. Push the latch on the PSU handle to the right (Figure 4–3), grip the handle and pull the PSU out of the enclosure.

Warning **Do not remove covers from the Power Supply (PSU). Danger of electric shock inside. Return the PSU to your supplier for repair.**

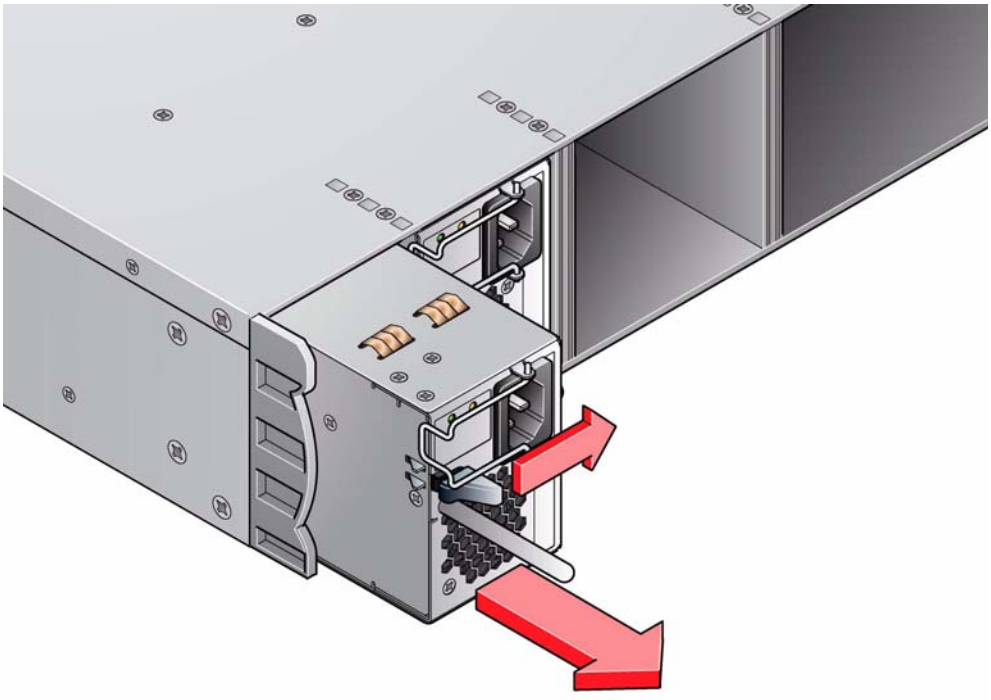


Figure 4–3 Removing a Power Supply Module

4.9.2 Installing a Power Supply Module

Warning **Do not mix Power Supply modules of different types or makes.**

1 Check for damage, especially to the rear connector on the PSU.

Caution *Handle the module carefully and avoid damaging the connector pins. Do not install the module if any pins appear to be bent.*

2 Slide the module into the enclosure (Figure 4–4).

3 Push the module home. A click should be heard as the handle latch engages.

4 Connect the power supply cords to the power source.

Note The alarm will sound until the new Power Supply module is operating correctly.

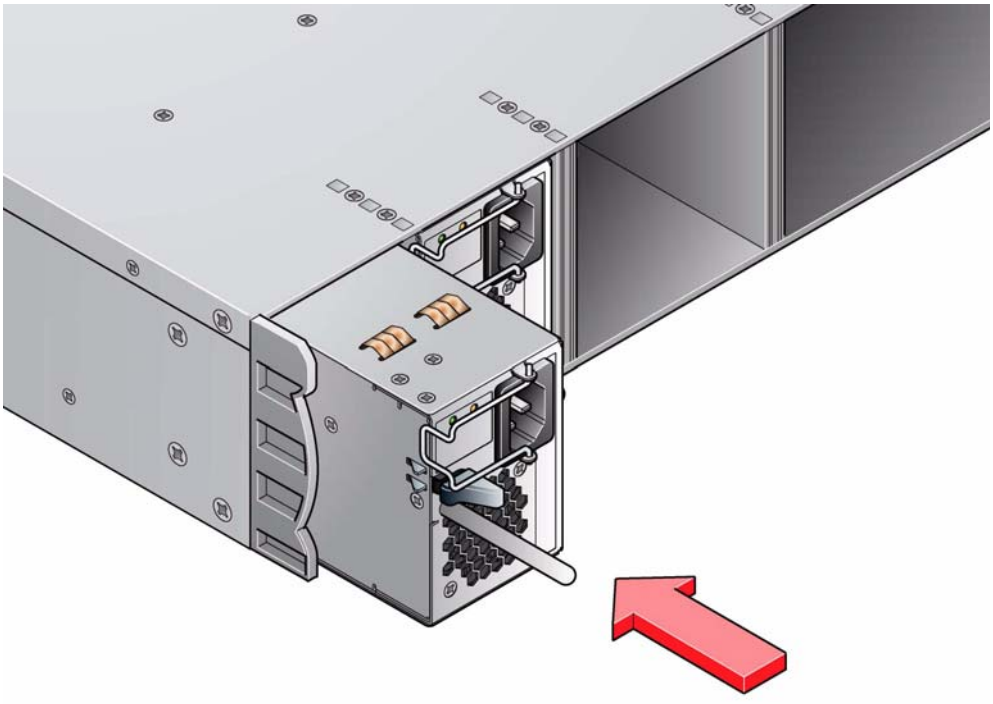


Figure 4–4 Inserting an Power Supply Module

4.10 Cooling Module

4.10.1 Removing a Cooling Module

1 Grasp latch (Figure 4–5) between thumb and forefinger. Squeeze thumb and forefinger together to release the latch.

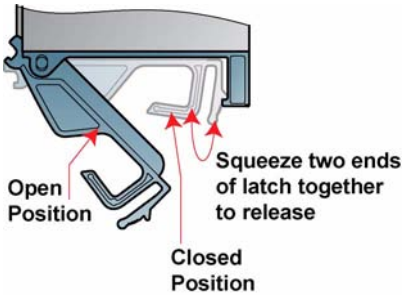


Figure 4–5 Cooling Module Latch

2 Pull the latch outward to cam the module out of the enclosure (Figure 4–6).

3 Withdraw the module.

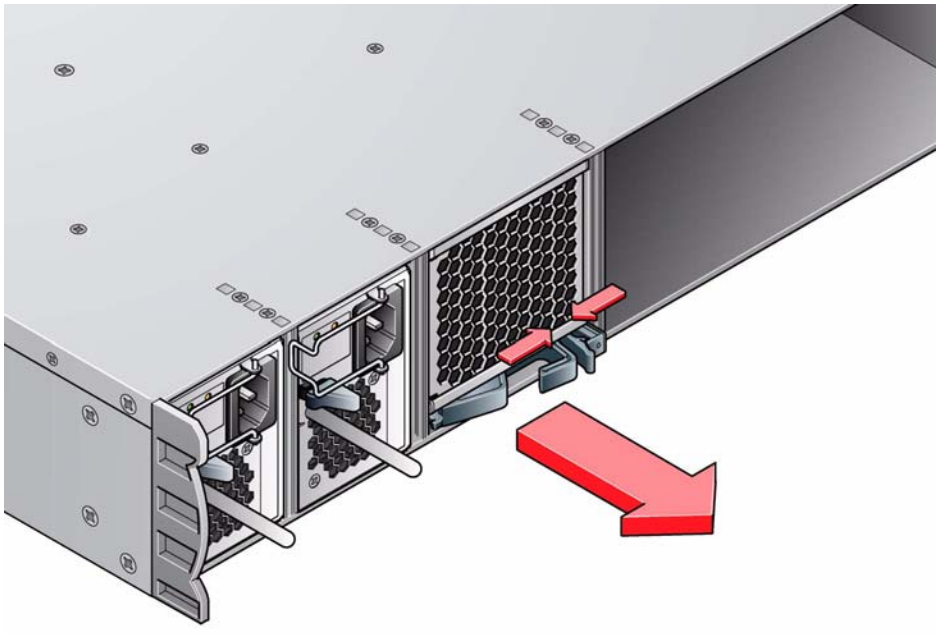


Figure 4–6 Removing a Cooling Module

4.10.2 Installing a Cooling Module

1 Check for damage, especially to the rear connector on the supply.

Caution *Handle the module carefully and avoid damaging the connector pins. Do not install the module if any pins appear to be bent.*

2 With the latch in the open position (see Figure 4–5), slide the module into the enclosure until the latch engages automatically (see Figure 4–7).

3 Cam the module home by manually closing the latch.(Figure 4–5). A click should be heard as the module latches engage.

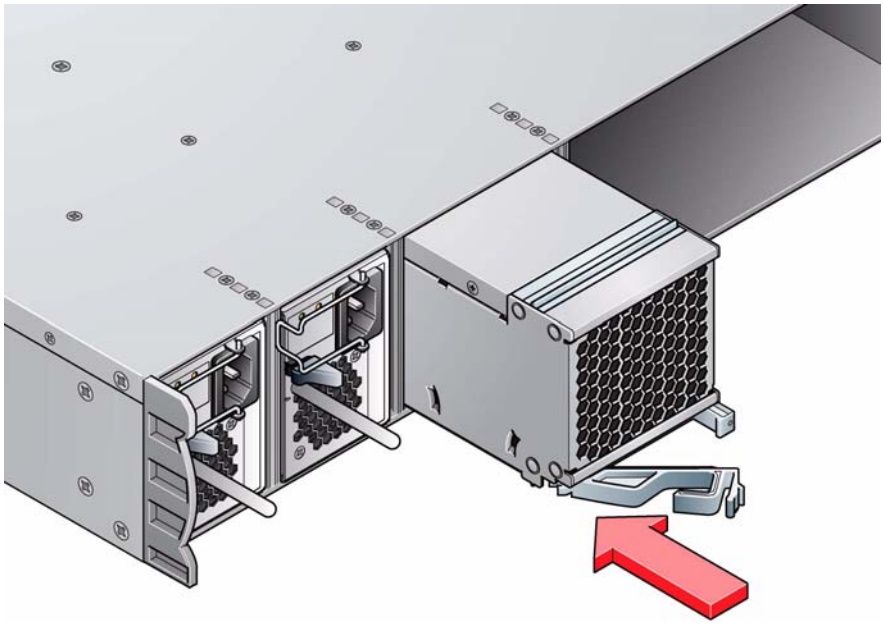


Figure 4–7 Cooling Module Installation

4.11 FC60SS RAID Module

Caution *If only one FC60SS RAID module is fitted then a Blank module MUST be fitted in the unused slot, there will be inadequate drive cooling if the slot is left open.*

The following procedures apply to both the FC60SS RAID module and the Blank (FC60SS) module.

4.11.1 Removing an FC60SS RAID Module

Warning **Do not remove this module unless a replacement can be immediately added. The system must not be run without all modules in place.**

1 Using two hands, grasp each latch between the thumb and forefinger of each hand. Squeeze thumb and forefinger together to release the latch.

2 Pull the latches outward to cam the module out of the enclosure (Figure 4–10).

3 Grip the latch handles and withdraw the module (Figure 4–8).

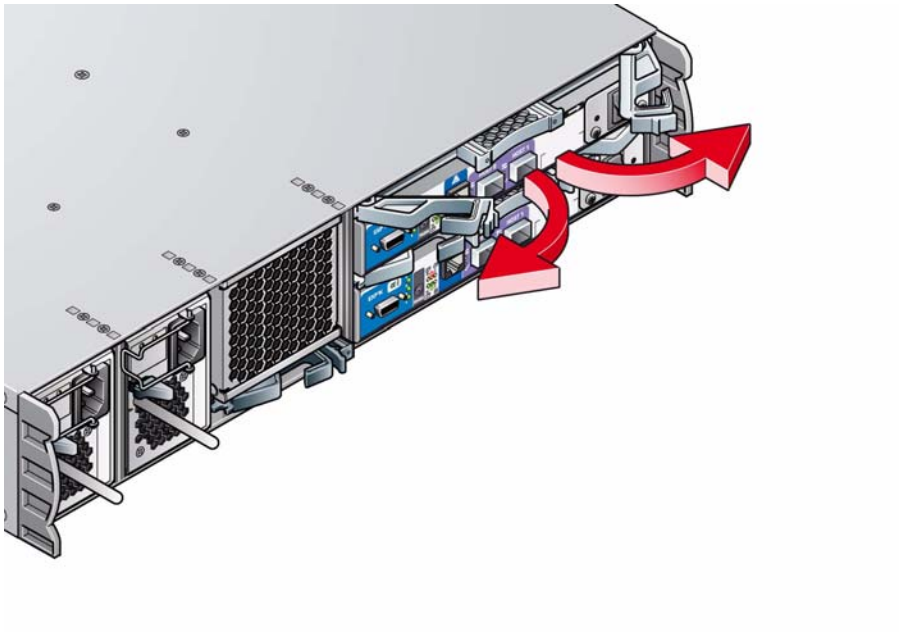


Figure 4–8 Removing a FC60SS RAID Module (1)

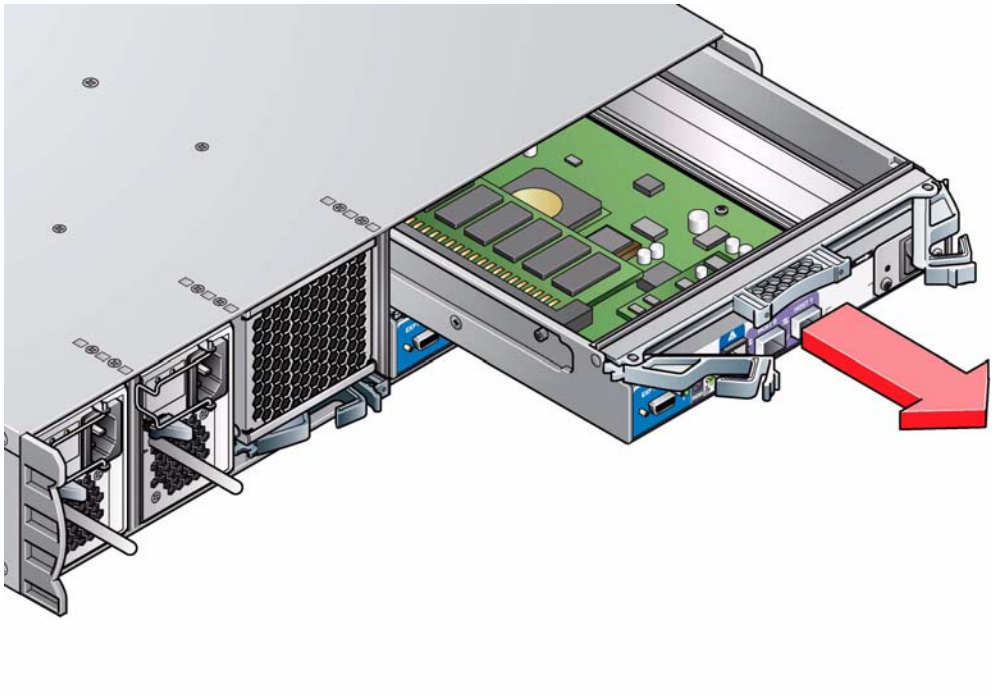


Figure 4–9 Removing a FC60SS RAID Module (2)

4.11.2 Installing an FC60SS RAID Module

Important **Host and Expansion Connectors:**
Class 1 Laser Product

- **If fitted with optical modules, the modules must be a UL (or other North American NRTL) RECOGNISED COMPONENT, must be approved by TUV (or other European Product safety test house) and the laser in the module must comply with Laser Class 1, US 21 CFR (J) & EN 60825-1.**

EMC Precautions:
If passive copper cables are connected, the cable must not have a connection to a common ground/earth point.

1 Check for damage, especially to the interface connector - do not install if the pins are bent.

2 With the latches in the open position (see Figure 4–10), slide the FC60SS RAID module into the enclosure until the latches engage automatically (Figure 4–11).

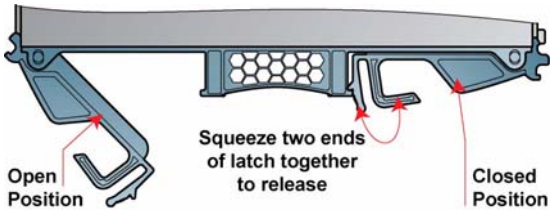


Figure 4–10 FC60SS RAID Module Latch Operation

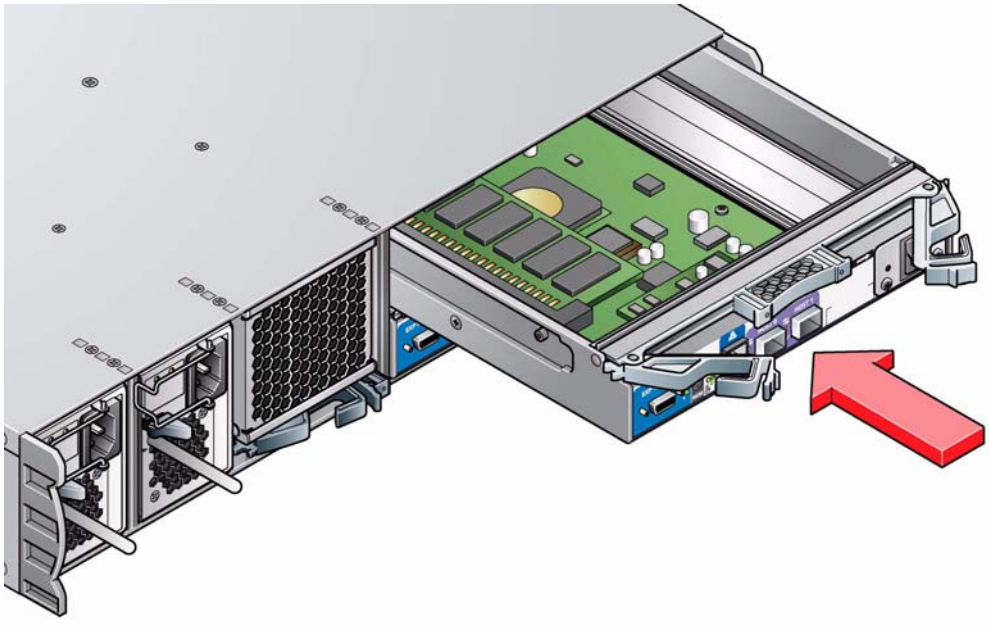


Figure 4–11 Installing a FC60SS RAID Module (step 2)

3 Cam the module home by manually closing the latches (see Figure 4–12).

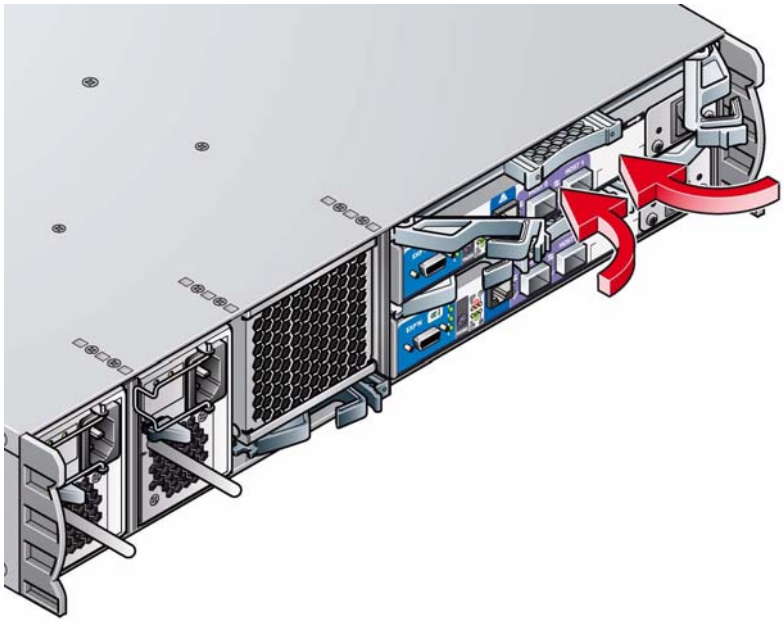


Figure 4–12 Installing a FC60SS RAID Module (step 2)

4 A click should be heard as the latches engage.

Note The FC60SS RAID module will take up to 1 minute to re-initialize onto the loop after re-cabling.

4.12 Battery Module

Warning **There is a danger of explosion if the battery is incorrectly replaced.**

Dispose of used batteries in accordance with the manufacturer's instructions and national regulations.

4.12.1 Removing a Battery Module

1 Operate the release latch and slide the Battery module out of the FC60SS RAID module (Figure 4–13).

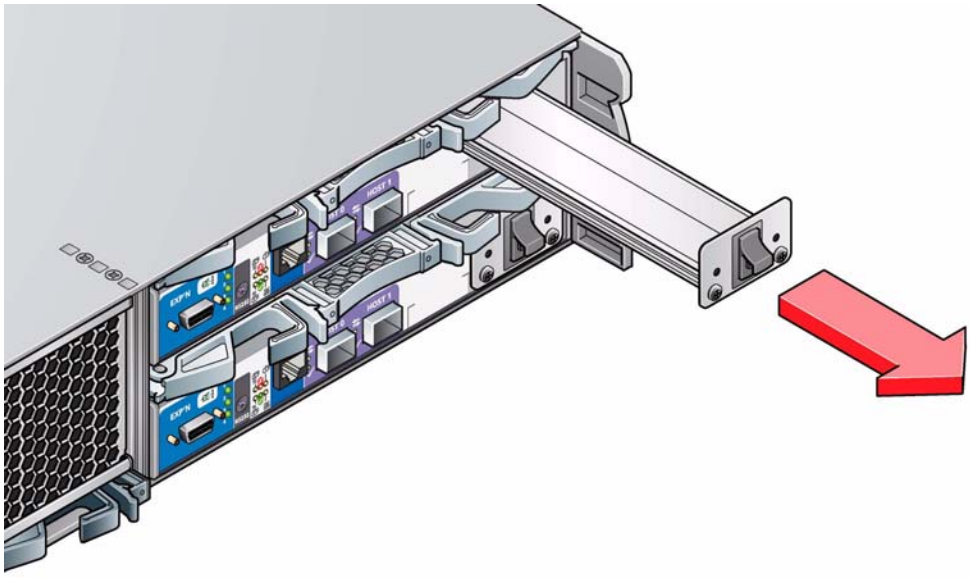


Figure 4–13 Removing a Battery Module)

4.12.2 Installing a Battery Module

1. Check for damage, do not install if there are any outer signs of damage.
2. **Slide the Battery module into the vacant slot on the right hand side of the FC60SS RAID module** (Figure 4–14).

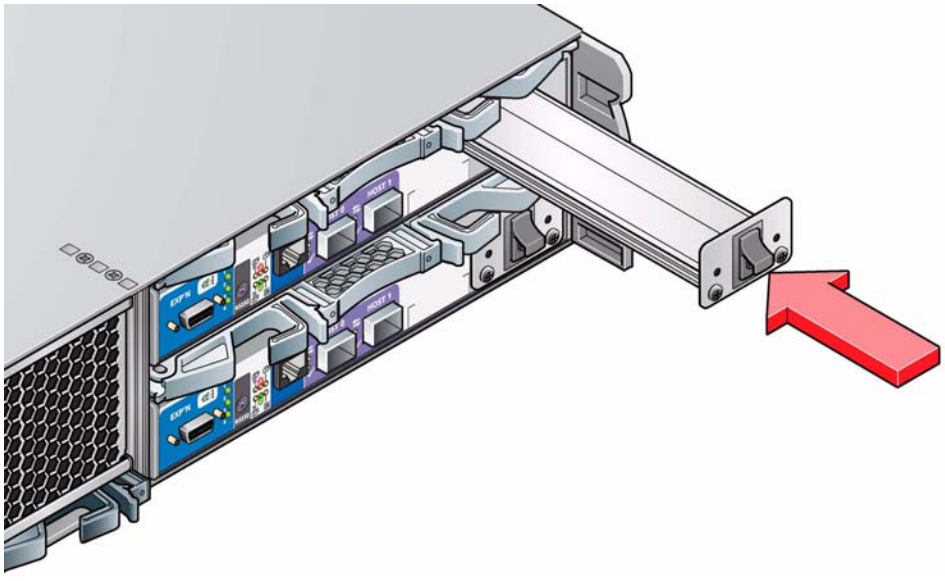


Figure 4–14 Battery Assembly Installation

4.13 Removing/Replacing Disk I/O Modules

To remove/replace a Disk I/O module, please follow the procedures for Removing and Replacing a FC60SS RAID Module as defined in sections 4.11.1 on page 60 and 4.11.2 on page 62.

4.14 Drive Carrier Module

Warning **Observe all conventional ESD precautions when handling FC60SS modules and components. Avoid contact with backplane components and module connectors, etc.**

4.14.1 Removing a Drive Carrier Module

Caution ***Drive spin down***
*Damage can occur to a drive if it is removed while still spinning, we recommend that you perform **All** steps of the following procedure to ensure that the drive has stopped prior to removal:*

1 Release the carrier handle, by pressing the latch in the handle towards the right (Figure 4–15).

Note The anti-tamper lock must be off.

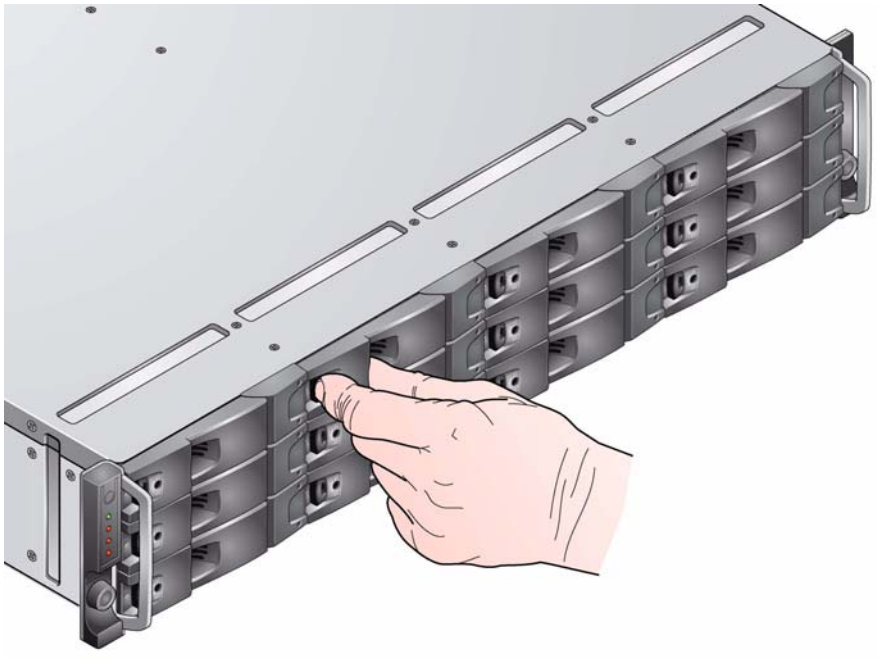


Figure 4–15 Removing a Drive Carrier Module (step 1)

2 Gently withdraw the Drive Carrier module approximately 1 inch (25mm) and wait 30 seconds.

3 Withdraw the module from the drive bay (Figure 4–16).

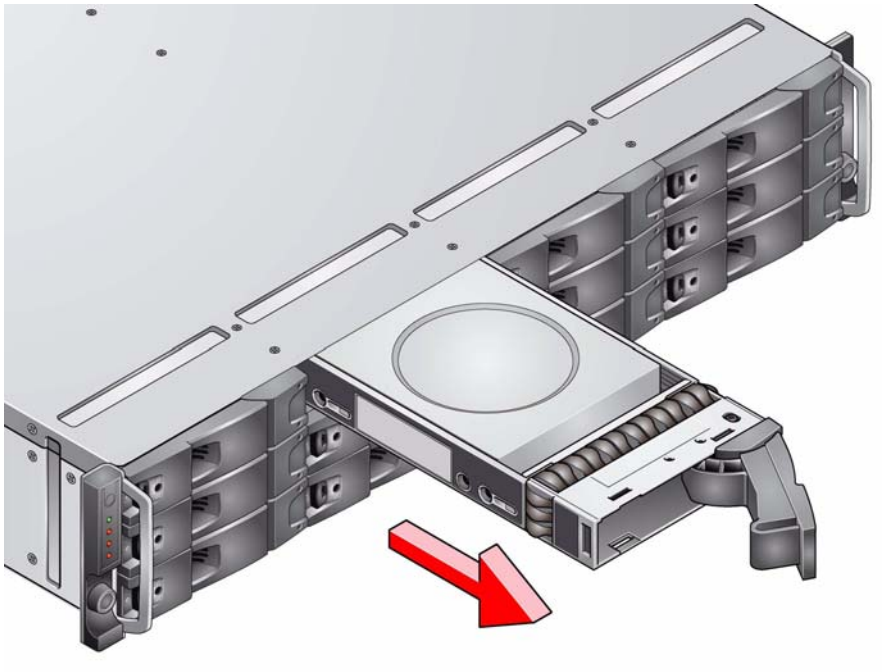


Figure 4–16 Removing a Drive Carrier Module (step 3)

4.14.2 Installing a Drive Carrier Module

Warning **All drive bays must be fitted with Drive Carrier modules or Dummy Carrier modules to maintain a balanced air flow.**

4.14.2.1 Drive Carrier Configuration

Important **Before you install the drive carrier modules in your FC60SS enclosure, please refer to Section 2.2 on page 19 for system configuration information.**

4.14.3 Installation Procedure

Important **Ensure that the carrier is orientated so that the drive is uppermost and the handle opens from the left.**

1 Release the carrier handle, by pressing the latch in the handle towards the right (Figure 4–17) and insert the carrier into the enclosure.

Figure 4–17 Drive Carrier Module with Handle Released

Note: If the anti-tamper locks have been activated, please refer to section 2.10.3, ”Engaging the Anti-tamper Locks”, on page 34

2 Slide the carrier, gently, all the way into the enclosure until it is stopped by the camming lever on the right of the carrier (Figure 4–18)

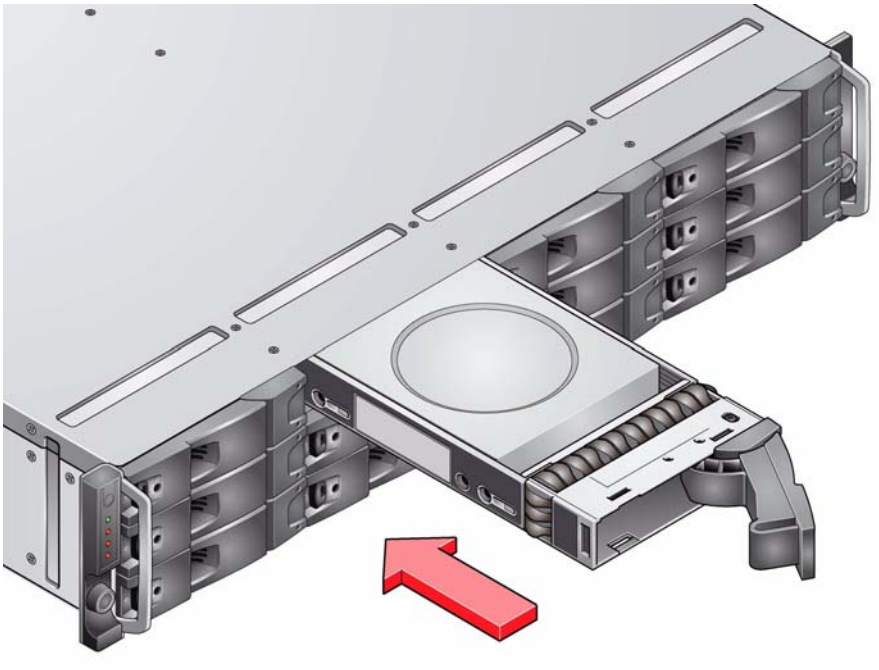


Figure 4–18 Installing a Drive Carrier Module (step 2)

3 Cam the carrier home - the camming foot on the base of the carrier will engage into a slot in the enclosure. Continue to push firmly until the handle fully engages. A click should be heard as the latch engages and holds the handle closed (Figure 4–15).

Caution *Ensure that the carriers are fully engaged in the enclosure, as shown in Figure 4–19.*

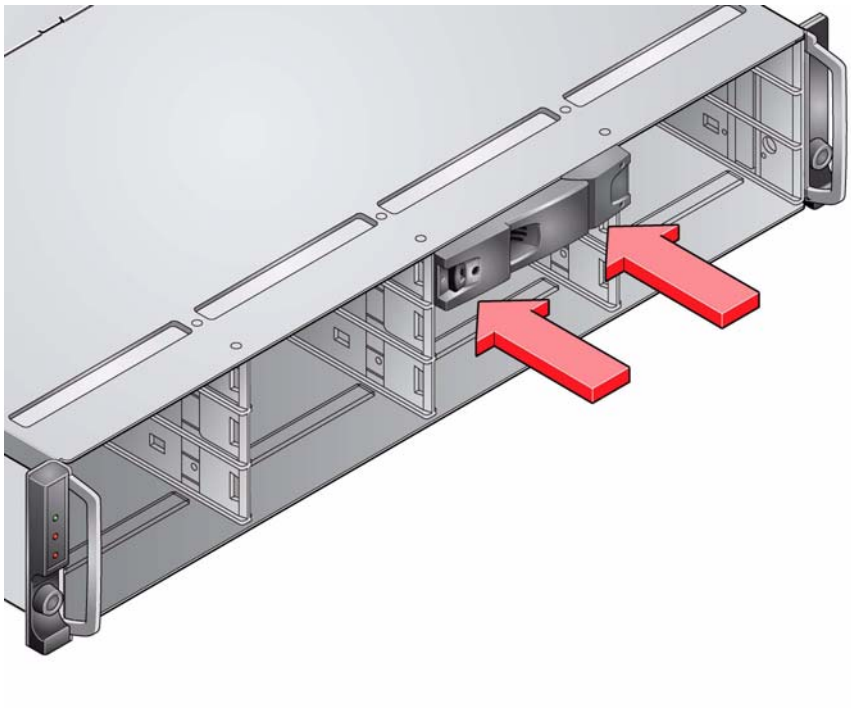


Figure 4–19 Engaging a Drive Carrier Module in an Enclosure

4.14.4 Dummy Drive Carrier Module Removal/Replacement

Dummy drive carrier modules are removed and replaced in the enclosure simply by pulling the module out of the enclosure or pushing it into place.

4.15 Spare Parts and Ancillary Items

The following replaceable parts are available for FC60SS SAS Enclosure Platform:

- Chassis including Backplane and integrated Ops Panel
- 350W AC Power Supply Module
- Drive Carrier Module
- FC60SS RAID Module (512Mb DDR2 SDRAM)
- FC60SS RAID Module (1024Mb DDR2 SDRAM)
- Cooling Module
- Battery Module
- Dummy Drive Carrier Module
- Blank I/O Module (FC60SS/Expansion)
- Disk I/O Module
- SFP module, optical
- Cables:
  - LC - LC optical cables (500m length)
  - RS232 cable
  - LAN cable
  - SAS cables
  - SATA cables
  - External FC-AL Interface Cables
- Power Cords (Country specific)
- All documentation
- Keys, Anti-tamper Lock *(for Drive Carrier modules).*

Index

a

airflow 14
Alarm Mute push-button 52
anti-static wrist or ankle strap 21
anti-tamper lock 13, 34, 65
Audible Alarm 5, 52, 53, 54, 55
Auto Start Failure 53
auto start failure 53

b

Backplane 2, 3, 9, 12, 21, 25, 56, 65
Battery module 11
bay 12, 19
Blank Modules 2, 3, 6, 14, 19, 56

c

chassis 2, 3, 25
chassis assembly 3
Chassis Installation 25
CONTROLLER FAULT LED 53
Cooling Module 2, 3, 7, 56
Cooling Module Fault LED 8

d

direct power connection 36
disk drive 3, 20
Disk Drive LEDs 45
Disk drive status 52
Disk I/O module 3, 6, 12
Disk I/O Module LEDs 12, 45, 51
Drive Bay 19
Drive Carrier Configuration 20, 66
drive carrier handle 13
Drive Carrier Module 2, 3, 6, 13, 20, 45, 48, 65, 66
Drive Carrier Module LEDs 48, 52
Drive Location Rules 33
Drive Slot Arrangement 33
Drive spin down 65
Drive Start 34
Drive Status Indicators 13
Dummy Carrier module 6, 14, 20, 56, 66
Dummy Drive Carrier Module Removal/ Replacement 68

e

Enclosure 2, 14, 56
Enclosure Chassis features 3
Enclosure Configuration 27
Enclosure Drive Bay Numbering Convention 20
Enclosure Installation Procedures 21
Enclosure System Interface/Operators Panel 4
Enclosures Expansion 32
Engaging the Anti-tamper Locks 34
ESD precautions 21, 56, 65
ESI processor 53
Ethernet cable 9, 31
Ethernet Connection 31

f

FC60SS RAID module 2, 3, 6, 9, 27, 53, 62
FC60SS RAID Module LEDs 9, 44, 51
fan failure 54
FC_AL signal 48
Fibre Channel Interface 27

g

Grounding Checks 36

h

Hardware Faults 56
HBA 21
Host Bus Adaptors (HBAs) 27

i

IEC 320 connector 37
Installing a Battery Module 64
Installing a Cooling Module 60
Installing a Drive Carrier Module 66
Installing a Power Supply Module 57
Installing an FC60SS RAID Module 62

m

Module Fault LED 41, 57

o

Operator's (Ops) Panel 2, 4
Ops Panel 4, 9, 12, 25, 36, 49, 56
Ops Panel LEDs 4, 41, 42, 49, 52
optical SFP components 27

p

PDU 41
plug-in module 2, 3, 19
power cord 35, 57
Power Cord Connection 35
power cords 19
Power Distribution Unit 21, 36
Power Down 46
Power On 41
Power On LED 36, 41
Power Supply Faults 54
Power Supply LEDs 6, 41, 54, 55
Power Supply module 2, 3, 6, 7, 19, 35, 37, 55, 56, 57, 58
PSU 9, 12, 57
PSU LEDs 41, 48
PSU voltage operating ranges 6

r

Rack Distribution System 36
Rack Installation Pre-Requisites 22
Rack Mounting Rail Kit 22, 25
RAID Configuration Utility interface, menu-based 26
RAID Configuration Utility interface, text based 27
Removing a Battery Module 63
Removing a Cooling Module 59
Removing a Drive Carrier Module 65
Removing a Power Supply Module 57
Removing an F60SS RAID Module 60
Removing/Replacing Disk I/O Modules 65
Replacing a Module 56
RJ45 10/100/BaseT Ethernet port 9, 31
FC60SS-1220 enclosure 2, 4, 5, 6, 7, 19, 20, 21
FC60SS-XPN enclosures 12, 32, 33
RS232 socket 9

s

SAS patch cables 32
SES Management Services 20
SFP port 9
Slot 0 location 2
Slot 1 location 2
Small Form Factor Pluggable (SFP) modules 9
Spare Parts and Ancillary Items 68
Starting the Drives 45
Status Indicators (LEDs) 48
StorView ® Storage Management software 10, 26
switch ports. 27
System airflow 7
SYSTEM FAULT LED 54, 55
System Faults 53

t

Thermal Alarm 55
Thermal Control 54
Thermal Warnings 55
Troubleshooting 53

u

Unpacking the Enclosure System 21
UPS 21

v

Visible Alarms 5